1. आयुर्वेद परिचय

1) 'आयुर्वेद' शब्द – निरुक्ती

- आयुषः वेदः आयुर्वेदः।

2) 'आयु' शब्द – व्याख्या, पर्याय

- आयु इति जीवित कालः।
- शरीर – इंद्रिय-सत्व – आत्मा संयोगो धारि जीवितम्।

  नित्यगः अनुबन्धश्च पर्यायः आयुरुच्यते ॥ ... च.सू.

3) ''शरीर'' – निरुक्ती, व्याख्या

- शीर्यते तत् शरीरम्।
- तत्र शरीरं नाम चेतनाधिष्ठानभूतं

  पंचमहाभूत विकार समुदायात्मंक समयोगवाही। ... च.शा.

4) ''शरीर''– पर्याय एवं अन्य व्याख्या

- आत्मनो भोगायतनं शरीरम्।
- आपाद तलमस्तमाकृतिः ॥

काय	–	चीयते अनेन इति कायः	- चय	(Anabolism)
शरीर	–	शीर्यते अनेन इति शरीरम्	- अपचय	(Catabolism)
देह	–	धार्यते अनेन इति देहः	- चयापचय	(Metabolism)

5) त्रयोपस्तंभ

- सत्वम – आत्मा – शरीरं व त्रयम् एतत् त्रिदण्डवत्।

  लोकास्तिष्ठति संयोगात् तत्र सर्व प्रतिष्ठितम्। ... च. सू.

6) शारीरक्रिया विज्ञान – महत्व

- शरीर विचयः शरीर उपकारार्थम् इष्यते।

  ज्ञात्वा हि शरीरतत्वं शरीर उपकार करेषु भावेषू ज्ञानम् उत्पद्यते।

  तस्मात् शरीरविचय प्रशंसन्ति कुशलाः ॥ ... च. शा.

7) ''क्रिया'' शब्द – पर्याय एवं व्याख्या

- प्रवृत्तिस्तु खलु चेष्टा कार्यार्था, स एवं क्रिया, कर्म यत्नः,

  कार्यसमारम्भश्च। ... च. वि.
- प्रयत्नादि कर्म चेष्टितम् उच्यते ॥ ... च. सू.
- संयोगे च विभागे च कारणं द्रव्यम्अश्रितम्।

  कर्तव्यस्य क्रिया कर्म, कर्म न अन्यद् अपेक्षते ॥ ... च. सू.

8) अष्टांग आयुर्वेद

- काय बाल ग्रह उर्ध्वांग शल्य दंष्ट्रा जरा वृषान् ॥ ... अ. ह. सू

9) आयुर्वेद – उद्देश

- स्वस्थस्य स्वास्थ्य रक्षणम्।

  आतुरस्य विकार प्रशमनं च ॥ ... च. सू.

10) ''स्वस्थ'' व्यक्ति – व्याख्या (सुश्रुतोक्त)

- समदोषः समाग्निश्च समधातुमलक्रियाः।

  प्रसन्नात्मेन्द्रिय मनाः स्वस्थ इति अभिधीयते ॥ ... सु. सू.

11) ''स्वस्थ'' व्यक्ति – व्याख्या (काश्यपोक्त)

- अन्नाभिलाषो, भुक्तस्य परिपाकः सुखेन च।

  सृष्टविण् मूत्र वातत्वं, शरीरस्य च लाघवम्।

  सुप्रसन्नेन्द्रियत्वं च, सुख स्वप्न प्रबोधनम्।

  बल वर्णायुषां लाभः सौमनस्यं समाग्निता ॥

  विद्यात् आरोग्यलिंगानि विपरीते विपर्ययम। ... का. खिल आ. ५

12) ''आयुर्वेद'' – व्याख्या

- हिताहितं सुखं दुःखम् आयुस्तस्य हिताहितम्।
  मानं च तच्च यत्रोक्तं आयुर्वेदः स उच्यते ।। ... च. सू.

13) 'चिकित्सा' – व्याख्या

- याभिः क्रियाभिर्जायन्ते शरीरे धातवः समाः।
  सा चिकित्सा विकाराणां कर्म तद् भिषजांस्मृतम् ।। ... च. सू.

2. मौलिक सिध्दांत

1) सिध्दांत – व्याख्या

- सिध्दान्तो नाम स यः परीक्षकैर्बहुविधं परीक्ष्य, हेतुभिश्च साधयित्वा स्थाप्यते निर्णयः। ... च. वि.

2) महत्वपूर्ण सिध्दान्तों के नाम

1) लोकपुरुष साम्य सिध्दांत
2) पांचभौतिक सिध्दांत
3) दोषधातुमलमूलत्वम्
4) सामान्य-विशेष सिध्दांत
5) रोग आरोग्यस्य कारणम्
6) रोग के त्रिविध कारण
7) सत्कार्यवाद
8) द्रव्य - गुण - कर्म सिध्दान्त

3) लोक पुरुष साम्य सिध्दान्त

- यावन्तो हि लोके मूर्तिमन्तो भावविशेषाः तावन्ताः पुरुषे, यावन्तः पुरुषे तावन्तो लोके इति।

रचनात्मक साधर्म्य

- सर्वम् इदम् पांचभौतिकम् अस्मिन अर्थे।

क्रियात्मक साधर्म्य

- विसर्ग आदान विक्षेपैः सोम सूर्य अनिल यथा।
  धारयन्ति जगत् देहं कफपित्तअनिल स्तथा ।। ... सु. सू.

4) सृष्टीउत्पत्ति के कारण

- स्वभावम् ईश्वर कालं यदृच्छां नियति तथा।
  परिणामं च मन्यन्ते प्रकृतिः पृथुदर्शिनः ।। ... सु. शा.

5) पांचभौतिक द्रव्य के गुण तथा कार्य (अ. ह. सू.)

- तत्र द्रव्य गुरु स्थूल स्थिर गन्धगुणोत्बणम् ।
  पार्थिव गौरव स्थैर्य संघातोपचयावहम् ॥१॥
- द्रव-शीत गुरु स्निग्ध मन्द सान्द्र रसोल्बणम् ।
  आप्यं स्नेहंन विष्यन्द क्लेद प्रल्हाद बंधकृत ॥२॥
- रुक्ष तीक्ष्ण उष्ण विशद सूक्ष्म रुप गुणोल्बणम् ।
  आग्नेय दाह भा वर्ण प्रकाश पचनात्मकम् ॥३॥
- वायव्य रुक्ष विशद लघु स्पर्श गुणोल्बणम् ।
  रौक्ष्य लाघव वैशद्य विचार ग्लानि कारकम् ॥४॥
- नाभसं सूक्ष्म विशद लघु शब्द गुणोल्बणम । सौषिर्य लाघकरम् ॥५॥

6) शरीर में उपस्थित पांचभौतिक घटक (च.सू.)

- तत्र यत् विशेषतः स्थूलं ।
  स्थिरं मूर्तिमंत् गुरु खर कठिनम् अंगं, नख अस्थि दन्त मांस चर्म वर्चः केश श्मश्रु लोम कण्डरादि तत् पार्थिवं गन्धो घ्राणं च ॥१॥
- यत् द्रव सर मंद स्निग्ध मृदु पिच्छिल रस रुधिर वसा कफ पित्त मूत्र स्वेदादि तत् आप्यं रसो रसनं च ॥२॥
- यत् पित्तम उष्मा च यो या च भाः शरीरे यत् सर्वम् आग्नेयं रुप दर्शनं च ॥३॥
- यत् उच्छ्वास प्रश्वास उन्मेष निमेष आकुंचन प्रसारण गमन प्रेरणधारणादि, तद् वायवीयं स्पर्शः स्पर्शनं च ॥४॥
- यद विविक्तम् उच्यते महन्ति च अणूनि स्त्रोतांसि तत् अन्तरीक्षं शब्दः श्रोत्रं च ॥५॥

7) महाभूत गुण

	महाभूत	गुण	असाधारण गुण
1	आकाश	शब्द	अप्रतिघात
2	वायू	शब्द + स्पर्श	चल
3	तेज	शब्द + स्पर्श + रुप	उष्णत्व
4	जल	शब्द + स्पर्श + रुप + रस	द्रव
5	पृथ्वी	शब्द + स्पर्श + रुप + रस + गंध	खर

8) दोष धातु मल – मूलं हि शरीरं ।

- यस्मात् शरीर दोषादि मूलं, यथावृक्षादीनां संभव – स्थिति– प्रलयेषु मूलं प्रधानं, तथा शरीरस्य वातादय इत्यर्थः । ... सु.सू. (डल्हण – निबंधसंग्रह)

9) दोष – धातु – मल व्युत्पत्ती

- दोष • दूषयन्ति इति दोषः ।
- धातु • धारणात् धातवः ।
- मल • मलिनिकरणात् मलः ॥

10) दोष – व्याख्या

- प्रकृत्यारंभकत्वे सति दुष्टिकर्तृत्वम दोषत्वम् ।

11) महाभूत – त्रिगुण – दोषसंबंध

	महाभूत	त्रिगुण	दोष
1	आकाश	सत्वबहुलं	वात (वायु + आकाश)
2	वायु	रजोबहुल	-----
3	तेज	सत्व-रजो बहुल	पित्त (आग्नेय)
4	जल	सत्व-तमो	श्लेष्मा (अम्भ - पृथिविभ्यां)
5	पृथ्वी	तमोबहुल	-----

12) दोष – आरोग्य / अनारोग्य के कारण

- विकृता अविकृता देहं घ्नन्ति ते वर्तयन्ति च ।।

13) उपधातु – व्याख्या + नाम

- सिरा स्नायु रजः स्तन्यत्वचोगति विवर्जिताः ।
  धातुभ्यश्चोपजायन्ते तस्मात् ते उपधातवः ।। ... च. चि.
- रसात् स्तन्यं, ततो रक्तं, असृजः कण्डरा सिराः ।
  मांसाद् वसा, त्वचां षट्श्च मेदसः स्नायुसंभवाः ।। ... च. चि.

14) सामान्य विशेष सिध्दान्त

- सर्वदा सर्वभावानां सामान्यं वृध्दिकारणम् ।
  ऱ्हासहेतुविशेषश्च प्रवृत्तिरुभयस्य तु ।। ... च. सू.

15) रोग के विविध कारण

- कालार्थकर्मणां योगो हीन मिथ्यातिमात्रकः ।
  सम्यक् योगश्च विज्ञेयो रोगारोग्यैककारणम् ।। ... अ. सू.

16) द्रव्य की व्याख्या तथा कारण द्रव्य

- यत्राश्रिताः कर्मगुणाः कारणं समवायि यत् तत् द्रव्यम् । ... च. सू.
- खादीन्यात्मा मनः कालो दिशश्च द्रव्यसंग्रहः।
  सेन्द्रियं चेतनं द्रव्ये, निरिन्द्रियम अचेतनम् ।। ... च. सू.

3. चिकित्साधिष्ठित पुरुष

1) चिकित्साधिष्ठित पुरुष – वर्गीकरण

1) एकधातुक पुरुष
2) त्रिधातुक पुरुष
3) षड्धातुक पुरुष
4) चतुर्विंशतिक पुरुष
5) संयोग पुरुष
6) राशि पुरुष
7) कर्मपुरुष

2) त्रिधातुक पुरुष

- सत्वं आत्मा शरीरं च त्रयम् एतत् त्रिदण्डवत् ।
  लोकः तिष्ठति संयोगात् तत्र सर्व प्रतिष्ठितम् ।। ... च. सू.

3) षड्धातुक पुरुष

- खादयाः चेतना षष्ठा धातवाः पुरुषः स्मृतः । ... च. शा.

4. त्रिदोष

1) दोष – प्रकार

- प्राकृत दोष (प्रकृति आरम्भक)
- वैकृत दोष (आहारसंभवज)

2) दोष गति (त्रिविध)

i) क्षय, स्थान, वृध्दि ii) उर्ध्व, अधः, तिर्यक iii) कोष्ठ, शाखा, मर्म

3) रस – दोष संबंध

दोष	वृद्धि	क्षय
वात	कटु, तिक्त, कषाय	मधुर, अम्ल, लवण
पित्त	कटु, अम्ल, लवण	मधुर, तिक्त, कषाय
कफ	मधुर, अम्ल, लवण	कटु, तिक्त, कषाय

4) दोष – धातु संबंध (आश्रयाश्रयी संबंध)

आश्रयी	आश्रय
वात	अस्थि
पित्त	रक्त, स्वेद
कफ	रस, मांस, मेद, मज्जा, शुक्र

5) विंशति गुण – व्याख्या

	गुण	विपर्यय
1	गुरु = द्रव्यस्य बृंहणे कर्मणि शक्तिः। (माष)	लघु = लंघने लघुः। (मुद्ग, लाजा)
2	मन्द = शमने मन्दः। (दुग्ध)	तीक्ष्ण = शोधने तीक्ष्णः। (मिर्च)
3	हिम = स्तम्भने हिमः। (चंदन)	उष्ण = स्वेदने उष्णः। (मरिच)
4	स्निग्ध = क्लेदने स्निग्धः। (घृत)	रुक्ष = शोषणे रुक्षः। (यव)
5	श्लक्ष्ण = रोपणे श्लक्ष्णः। (दुग्धपाषाण)	खर = लेखने खरः। (करंज)
6	सान्द्र = प्रसादेन सान्द्रः। (मलाई)	द्रव = विलोडने द्रवः। (जल)
7	मृदु = श्लथने मृदुः। (सैन्धव लवण)	कठिण = दृढने कठिणः। (प्रवाल)
8	स्थिर = धारणे स्थिरः। (जातिफल)	चल = प्रेरणे चलः। (वात)
9	सूक्ष्म = विवरणे सूक्ष्मः। (मधु)	स्थूल = संवरणे स्थूलः। (दधि)
10	विशद = क्षालने विशदः। (गुग्गुलु)	पिच्छिल = लेपने पिच्छिल। (इसबगोल)

6) 'वात' – महत्व

- **पित्तं पंगुः कफ पंगुः पंगवो मलधातवः।**
  वायुना यत्र नीयन्ते तत्र वर्षन्ति मेघवत्॥

7) त्रिदोष – निरुक्ति

वात – तत्र 'वा' गतिगन्धनयोरिति धातुः। (गन्धन = उत्साह)

पित्त – तप् सन्तापे।

कफ – केन (जलेन) फलति इति कफाः।

8) त्रिदोष – स्वरुप

वात – अव्यक्तः व्यक्तकर्मा च।

पित्त – पित्तं आग्नेयम्।

कफ – श्लेष्मा सौम्यः॥

9) त्रिदोष – पर्यायी नाम

वात – मरुत्, मारुत, अनिल, पवन, समीरण , प्रभंजन, मातरिश्वा, सदागती, श्वसन

पित्त – अग्नी, तेज, अनल, उष्मा, दहन, पाचक, वन्ही, वैश्वानर, धनंजय, पावक, शिखी, हुताशन

कफ – श्लेष्मा, सोम

10) त्रिदोष – गुण (अ. ह. सू.)

वात – तत्र रुक्षो लघुः शीतः खर सूक्ष्मश्चलो ऽ निलः।

पित्त – पित्त सस्नेह तीक्ष्णोष्णं लघु विस्रं सर द्रवम्।

कफ – स्निग्धः शीतो गुरुर्मन्दः श्लक्ष्ण मृत्स्नः स्थिरः कफः॥

11) त्रिदोष – स्थान (अ. ह. सू.)

वात – पक्वाशय कटि सक्थि श्रोत्र अस्थि स्पर्शनेंद्रियम्।
स्थानम् वातस्य तत्रापि पक्वाधानं विशेषतः।

पित्त – नाभिः आमाशयः स्वेदो लसीका रुधिरं रसः।
दृक स्पर्शनं च पित्तस्य नाभिस्तत्र विशेषतः॥

कफ – उर कण्ठ शिरः क्लोम पर्वाणि आमाशयो रसः।
मेदो घ्राणं च जिव्हा च कफस्य सुतराम उरः।

12) त्रिदोष – सामान्य कार्य

वात – वायुः तन्त्र यन्त्र धरः, प्राण-उदान-समान-व्यान अपानात्मा, प्रवर्तक चेष्टानाम् उच्च अवचानाम्, नियन्ता प्रणेता च मनसः सर्वेन्द्रियाणाम् उद्योजकः, सर्वोन्द्रियार्थानाम् अभिवोढा, सर्व शरीर धातू व्युहकरः, सन्धानकरः शरीरस्य, प्रवर्तको वाचः प्रकृति शब्दस्पर्शयोः, श्रोत्रस्पर्शनयोर्मूलं, हर्ष-उत्साह योनिः, समीरणो अग्नेः, दोष संशोषणः, क्षेप्ता बहिर्मलानाम्, स्थूलाणू स्त्रोतसां भेत्ता, कर्ता गर्भाकृतीनाम्, आयुषो अनुवृत्ति प्रत्ययभूतः। भवति अविकृतः॥ ... च.सू.

पित्त – पित्त पक्त्युष्मदर्शनैः।
क्षुत् तृट् रुचि प्रभा मेधा धी शौर्य तनुमार्दवैः। ... अ.ह सू.

- अग्निरेव शरीरे पित्तान्तर्गतः कुपिता कुपितः शुभाशुभानि करोति। तद् यथा पक्तिम् - अपक्तिम्, दर्शनम्-अदर्शनम्, मात्रामात्रात्वम् उष्मणः प्रकृति विकृति वर्णो, शौर्यं-भयं, क्रोधं-हर्षः, मोहं-प्रसाद इति एवम् आदीनाम् च अपराणि द्वंद्वानीति॥ ... च. सू.

कफ – श्लेष्मा स्थिरत्वं स्निग्धत्व संधिबंध क्षमादिभिः।

- सोम एव शरीरे श्लेष्मान्तर्गतः कुपिता कुपितः शुभाशुभानि करोति। तद्यथा दादर्यं-शेथिल्यम्, उपचय-कार्श्यं, उत्साहं - आलस्यं, वृषतां-क्लीबतां, ज्ञानं-अज्ञानं,बुध्दि-मोहम् एवम् आदिनी च अपराणि द्वद्वानीति॥

... च. सू.

13) त्रिदोष – उपप्रकार – स्थान एवं कार्य (अ. ह. सू.)

वात प्रकार – प्राण, उदान, व्यान, समान, अपान

प्राण
- स्थानं प्राणस्य मूर्धोरः। कष्ठ जिव्हाश्च नासिका।
  बुध्दि हृदय इंद्रिय चित्त धृक्।
  ष्ठीवन क्षवथु उद्गार निश्वास अन्न प्रवेशकृत॥

उदान
- उरः स्थानम् उदानस्य। नासानाभिगलांश्चरे
- वाक् प्रवृत्ति प्रयत्न उर्जा बल वर्ण स्मृतिक्रियः॥

व्यान
- व्यानो हृदि स्थितः। कृत्स्न देहचारी महाजवः॥
- कृत्स्त्रदेहचरो व्यानो रससंवहनोद्यतः॥
  स्वेदासृक् स्त्रावणाश्चापि पंचधा चेष्टयत्यपि॥ ... सु. नि.

समान
- समानो अग्निसमीपस्थः ।
- अन्नं गृण्हाति पचाति विवेचयति मुंचति ।।

अपान
- अपानो अपानगः । श्रोणि बस्ति मेढ्र उरु गोचरः ।।
- शुक्र आर्तव शकृत मूत्र गर्भ निष्क्रमणक्रियः ।।

पित्त प्रकार – पाचक, रंजक, भ्राजक, साधक, आलोचक ।

पाचक
- पित्तं पंचात्मकं तत्र पक्वआमाशय मध्यगम् ।
  पंचभूतात्मकत्वे ऽपि यत् तेजस गुणोदयात् ।
  त्यक्तद्रवत्वं पाकादि कर्मणा अनल शब्दितम् ।
  पचति अन्नं विभजते सारकिट्ट पृथक् तथा ।
  तत्रस्थम् एव पित्ताणां शेषाणां आपि अनुग्रहम् ।
  करोति बलदानेन पाचकं नाम तत् स्मृतम् ।।

रंजक
- आमाशयाश्रयं पित्तं रंजक रस रंजनात ।।

साधक
- बुध्दिमेधाभिमानाद्यैरभिप्रेतार्थ साधनात् । साधक् हृदगतं पित्तं ।

भ्राजक
- त्वक्स्थं भ्राजकं भ्राजनात् त्वचः ।। भ्राजनं इति दीपनं प्रकाशनम् ।

आलोचक
- रुपालोचनतः स्मृतम् । दृक्स्थम् आलोचकं ।।

कफ प्रकार – क्लेदक, बोधक, अवलंबक, श्लेषक, तर्पक ।

क्लेदक
- यस्तु आमाशय संस्थितः । क्लेदकः सः अन्नसंघात क्लेदनात् ।।

बोधक
- रस बोधनात् । बोधको रसनास्थायी ।

अवलंबक
- उरस्थः स त्रिकस्य स्ववीर्यतः ।
  हृदयस्यान्नवीर्याच्च तत्स्थ एवाम्बुकर्मणाम् ।
  अतो अवलम्बकः श्लेष्मा ।।
  अवलंबनं इति स्वकर्मणि सामर्थ्यं उत्पादयति ।

श्लेषक
- संधिसंश्लेषात् श्लेषकः संधिषु स्थितः ।

तर्पक
- शिरः संस्थो अक्षतर्पणात् तर्पकः ।। (अक्ष = इन्द्रिय)

14) त्रिदोष – वृद्धि / क्षय लक्षण (अ. ह. सू.)

वातवृद्धि
- कार्श्य-कार्ष्ण्य-उष्णकामित्वं – कंप – आनाह शकृत्ग्रहान् ।
  बल – निद्रा – इंद्रिय – भ्रंश प्रलाप भ्रम दीनताः ।।

वातक्षय
- लिंग क्षीणे अनिले अंगस्य साद अल्पभाषिते हितम् ।
  संज्ञामोहस्तथा श्लेष्मवृध्दी उक्तामय संभवः ।।

पित्तवृद्धि
- पीत विट्मूत्र नेत्र त्वक्, क्षुत् – तृट् – दाह – अल्पनिद्रता पित्तं वृध्दं तु कुरुते ।

पित्तक्षय
- पित्ते मन्दो अनलः शीत प्रभाहानिः ।।

कफवृध्दी
- श्लेष्मा अग्निसदनं प्रसेक आलस्य गौरवम् ।
  श्वैत्य शैत्यश्लथांगत्वं श्वास कास अतिनिद्रता ।।

कफक्षय
- कफे भ्रमः । श्लेष्माशयानां शून्यत्वं हृद्रवः श्लथसंधिता ।।

15) त्रिदोषों की नैसर्गिक वृद्धि / क्षय (Physiological variations)

- वयो ऽ हो रात्रिभुक्तानां ते अन्तमध्यादिगाः क्रमात ।
- अहोरात्र (Circadian Rhythm, Biological Clock)

काल	दिन	रात्री
6 से 10	कफ	कफ
10 से 2	पित्त	पित्त
2 से 6	वात	वात

16) द्वंद्वज प्रकृति को सलाह देने के लिए सामायिक गुण

वात - पित्त → लघु ।
वात - कफ → शीत ।
पित्त - कफ → स्निग्ध ।

17) मेधा = ग्रंथावधारण शक्ती ।
बुद्धी = निश्चयात्मिका बुद्धी ।
स्मृती = अनुभवजन्य ज्ञानम् ।

18) ज्ञानेंदिय → श्रोत्र, त्वक्, चक्षु, रसना, घ्राण
कर्मेंद्रिय → वाक्, पाणि, पाद, पायु, उपस्थ
उभयेंद्रिय → मन

5. श्वसन प्रक्रिया

1) **श्वसन प्रक्रिया (शारंगधर – पूर्वखंड)**

- नाभिस्थः प्राणपवनः स्पृष्ट्वा हत्कमलान्तरम् ।
  कंठात बहिर्विनिर्याति पातुं विष्णुपदामृतम् ।।
  पीत्वा च अंबरपीयुषं पुनरायाति वेगतः ।
  प्रीणयन् देहम् अखिलं जीवं च जठरानलम् ।।

2) **श्वसन संख्या (योगचुडामणी ग्रंथोक्त)**

1 दिन में = 21,600 बार

1 घंटे में = 900 बार

1 मिनिट में = 15 बार

3) Respiratory System

Nose - Naso pharynx - pharynx - Trachea - bronchi - Bronchioles - Alveolar ducts - Alveolar air sacs - Pulmonary Alveoli.

4) Mechanism of Respiration

A) Muscular (Enlargement of Thoracic cavity)

B) Nervous (Regulation and coordination)

5) Name of Muscles

A) Quite Respiration

Diaphragm, Internal Intercostals, Serratus posterior, scaleni

B) Deep Inspiration

Sterno mastoid, Trapezium, Pectoral, Serratus Anterior, Dilator Nasi.

6) Nervous Control

Respiratory center, Afferent Nerves, Efferent Nerves.

7) Respiratory Centre

Below lower part of 4th ventricle and posterior part of Medulla. Centre is stimulated by

i) CO_2 excess

ii) O_2 lack

iii) Increase in H ion concentration e.g. during exercise

iv) Rise in temperature

v) Impulse from higher centre e.g. emotions, anger.

8) Functions of Respiration

i) Supply O_2 and Remove CO_2

ii) Regulate H ion concentration of Blood

iii) Increase Arterial O_2 pressure

iv) Regulation of Body temperature

v) Defends against microbes

vi) Traps and dissolves blood clots.

vii) Influences arterial concentration of chemical messengers.

9) Non-respiratory functions of lungs

i) Synthesis of surfactant

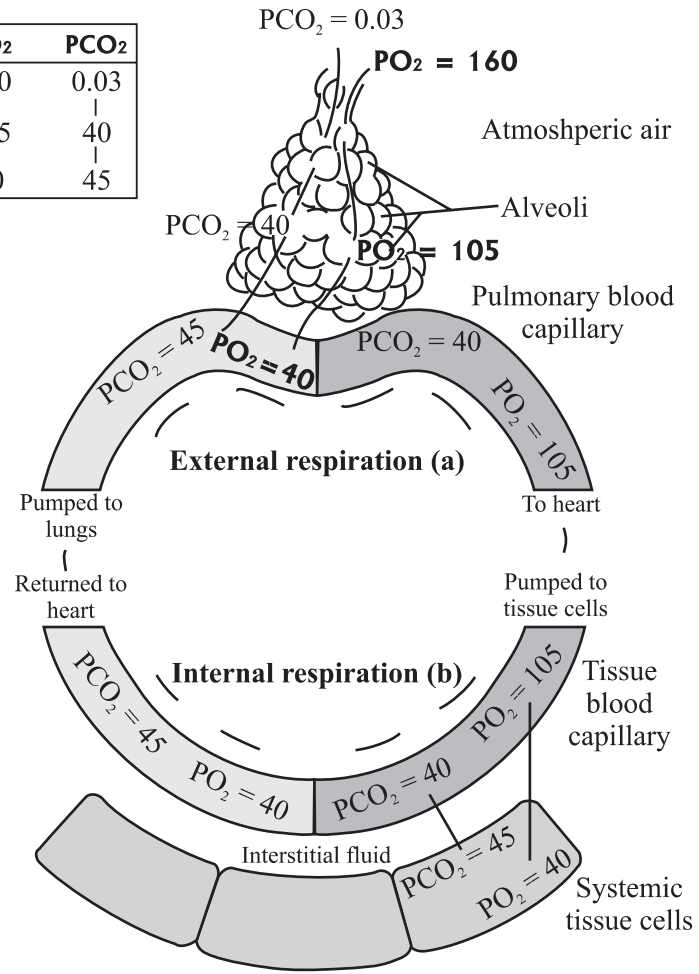
ii) Detoxify foreign substances

iii) Filtration - removal of thrombi
(By plasminogen activators and Heparin)

iv) Processing of Hormones.

10) Diagram showing Diffusion

PO_2	PCO_2
160	0.03
105	40
40	45



11) Functions of conducting portion of Airways

i) This is low resistance pathway for air

ii) Warms and moistens the air

iii) Defends against microbes, toxic chemicals, foreign matter (cilia, mucous and phagocytes are helpful for defend mechanism)

iv) Phonation.

12) Important Steps in Respiration process

i) Ventilation (Expansion of chest cavity)

ii) Diffusion (Gaseous exchange)

iii) Perfusion (O_2 & CO_2 carriage by blood)

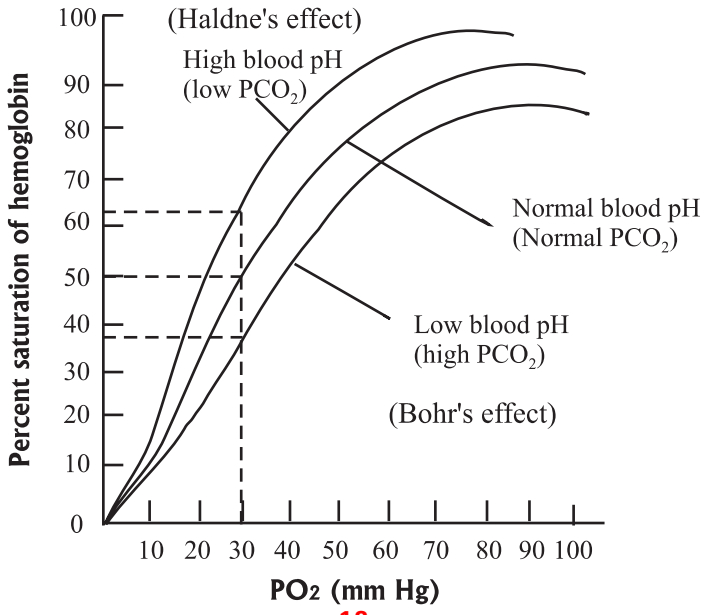
13) O_2 Transport mechanism

i) 98 % - O_2 is transported by Hb and only 2 % O_2 in dissolved form.

ii) $Hb_2 + O_2 \rightarrow Hb_2O_2 + O_2 \rightarrow Hb_2O_4 + O_2 \rightarrow Hb_2O_6 + O_2 \rightarrow Hb_2O_8 \rightarrow$ (Tissue PO_2 is low) $\rightarrow$ O_2 dissociates.

iii) O_2 Dissociation Curve

This graph explains how and when O_2 is get separated from Hb. In the lungs at the pressure of 104 mm of Hg) Hb is 100% saturated. When PO_2 is less than 40 (At tissue level) $\rightarrow$ O_2 starts separating from Hb. This is shown by normal middle curve.



iv) Bohr effect (Right shifting curve)

When demand of tissue for O_2 is high, Hb will not wait for PO_2, to fall upto 40 mm. It may start delivery of O_2 (Separation of O_2) at high PO_2 level-like 60 mm of Hg. It is seen when acidic pH, $H^+ \uparrow$, $CO_2 \uparrow$, temperature $\uparrow$.

v) Haldane's effect (Left Shifting curve)

This is opposite to Bohr effect. Here O_2 necessary to tissue is less. So O_2 dissociates at lower pressure than 40 mm. It is seen when temperature $\downarrow$, alkaline pH.

14) CO_2 Transport mechanism

i) 60 to 70% with **Bicarbonate**, 20 to 30% with **carbamino compound**, 5 to 10% with **dissolved** form.

ii) $CO_2 + H_2O = H_2CO_3 \rightarrow H^+ + HCO_3^-$

iii) $HCO_3 + Na^+ = NaHCO_3$ (Plasma) and
$HCO_3 + K^+ = KHCO_3$ (RBC)

iv) CO_2 + Hb (RBC) = Carbamino Hb and
CO_2 + Plasma protein = Carbamino protein

v) In dissolved form : $CO_2 + H_2O = H_2CO_3$
Vein $\rightarrow$ lungs $\rightarrow$ $CO_2 + H_2O$ (Water vapor)

15) Chloride Shift (Hamburger effect)

CO_2 from tissue, diffuses through capillaries. After entering into R.B.C., it reacts with water to form carbonic acid (H_2CO_3). H_2CO_3 dissociates into H^+ and HCO_3^-. 'H' ions combines with Hb (H Hb). Since HCO_3^- ions accumulates inside RBC, some of them diffuse into plasma. In exchange Cl^- ions diffuses from plasma into RBCs. This is called as chloride (Cl^-) shift.

Due to this shift, osmotic pressure inside the RBC increases. So osmotic absorption of fluid into RBC. So RBC of venous blood contain more quantity of fluid as compared to RBC of Arterial blood. Hence venous RBCs are more fragile than arterial RBCs.

16) Surfactant

Functional units of Lungs are alveoli

Two types of cells in lungs Alveoli.

i) Type I pneumocytes

ii) Type II pneumocytes.

Type II cells secrete a phospholipid rich product i.e. pulmonary surfactant. Which spreads over alveolar cell surfaces, moistens them and lowers alveolar surface tension and prevents alveolar collapse.

In premature babies, sometimes there is deficiency of surfactant and they suffer from RDS (Respiratory Distress Syndrome). In chronic smokers, Type II cells are inhibited. Hence A.R.D.S. develops.

17) Herring Breuer's Reflex

Lungs Alveoli distend, during Inspiration. This stimulates stretch receptors present at walls of alveoli upward traveling of afferent impulses along vagus nerve $\rightarrow$ inhibit inspiratory centre, which prevent further inflation and damage of lungs. This is (protective) Herring Breuer's Reflex.

18) Important Laws in respiration process

A) Boyle's law

At constant temperature, pressure of gas is inversely proportional to its volume $(P \propto \frac{1}{V})$

B) Charle's law

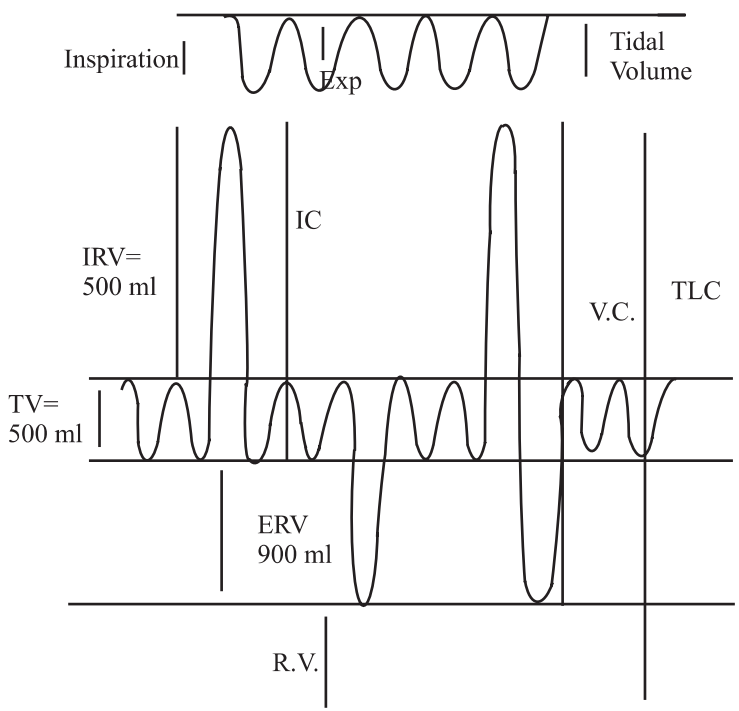
At constant volume, pressure of gas is directly proportional to its absolute temperature. ($P \propto T$)

C) Avogadro's law

Different gases, which have same volume, at same temperature and pressure, contain equal number of molecules.

19)

A) Static lung tests (Done with spirometer, spirovit, spiroanalyser)



i) Tidal volume = Air in or out in Normal breathing
= 400 - 500 ml.

ii) IRV = 2500 ml

iii) ERV = 900 ml

iv) VC = IRV + TV + ERV = 3300 – 4000 (females) and
= 4000 – 5000 (males)

v) RV = 1000 ml

vi) TLC = VC + RV.

vii) IC = TV + IRV

viii) ERC = ERV + RV.

B) Dynamic lung tests

i) $FEV_{1, 2, 3}$ (force expiratory volume at the end of 1, 2 & 3 sec)

ii) RMV = Resting minute ventilation
= Amount of air taken in or out in 1 min, in resting condition.
= TV x R. R. = 6 – 8 lit. / min

iii) MBC or MVV = Maximum Breathing Capacity
= 80 - 100 lit/min

iv) B. R. Breathing Reserve = MVV – RMV
= 100 – 10
= 90 lit. / min

B.R. will decide the fitness of a person

v) PEFR = Peak expiratory flow rate
= 500 lit/min.

Measured by peak flow meter.

20) Lung diseases

A) Obstructive = Asthma, bronchitis → V.C. = Not affected.

FEV1 = ↓↓,

PEFR = ↓↓

B) Restrictive = Pneumonia, plasma effusion, Pneumothorax, Fibrosis → VC ↓↓,

FEV_1 and PEFR = Not affected.

21) Modified acts of respiration

Coughing, sneezing, yawning, crying, laughing, hiccuping.

22) Control or respiration

Nervous control

The respiratory center consists of a medullary rhythmicity area (Inspiratory and expiratory area), Pneumotaxic and Apneustic area in pons. The inspiratory area has an intrinsic excitability which sets the basic rhythm of respiration. The Pneumotaxic and Apneustic areas coordinate the transition between inspiration and expiration.

23) Artificial respiration

Artificial respiration is needed, in various accidents, drowning, electric shock etc.

Methods

i) Mouth to mouth breathing
ii) Marshall Hall method
iii) Resusciator
iv) Tank respirator
v) Ambu bag
vi) Ventilator

6. रस – रक्त संवहन प्रक्रिया

1) **हृदय**

- हृ = हरति (To take back impure blood)
- द = ददाति (To supply pure blood)
- य = याम्यति (To control these activities)
- शोणित कफ प्रसादजं हृदयं।
- पुण्डरीकेण सदृशं हृदयं स्यात् अधोमुखम्।
- हृदयं चेतनास्थानम् उक्तं सुश्रुत देहिनाम्।
- तस्योपघातान् मूर्च्छाय भेदान्मरणमृच्छति।
- जाग्रस्तत विकसति स्वपतश्च निमीलति।
- व्यानो हृदि स्थितः।

हृदय और प्राण-उदान-व्यान वायु, साधकपित्त तथा अवलंबक कफ इन में घनिष्ठ संबंध होता है।

2) **रस-रक्त संवहन**

- व्यानेन रस धातुर्हिविक्षेपोचित् कर्मणा।
  युगपत् सर्वतो ऽ जस्त्रं देहे विक्षिप्यते सदा॥
- स तु व्यानेन विक्षिप्तः सर्वान् धातून् प्रतर्पयेत्॥
- हृदो रसो निः स्सरति तत एव च सर्वतः।
  सिराभि हृदय याति तस्मात् हृत् प्रभवं सिरा॥ ... भेलसंहिता
- स शब्द आर्चि जलसंतानवत् अणुना विशेषेण अनुधावति एवं शरीरं केवलम्॥

3) **नाडी परीक्षा**

- नाडी मूत्रं मलं जिव्हा शब्द स्पर्श दृक् आकृति॥ ... यो. र.

नाडी – वेग – 72 / मि. **बल** – उत्तम / मध्यम / हीन

ताल – सम / विषम **गति** – द्रुत / मध्यम / मंद

आकार – स्थूल / सूक्ष्म **स्पर्श** – उष्ण / शीत

दोषानुसार – वात की - सर्प

पित्त की - मंडूक

कफ की - हंसगति

4) Heart

William Harvey (1578-1657) discovered circulation of Blood. Heart weight = 300 gm. 3 layers → Pericardial, myocardium and Endocardial. Pericardium has parietal and visceral layers with pericardial fluid. 4 chambers → Rt and Lt Atrium and Rt/Lt ventricles. Rt auriculo ventricular valve = Bicuspid or Mitral valve. Pericardium protects heart from shock and mechanical injuries, provides lubrication and avoids friction, provides space for free movement of heart.

5) Cardiac muscles

Striated, involuntary. Adjacent cardiac muscle fibres form **inter calated disc** (Gap junction), which allow a rapid spread of stimuli. Para-sympathetic (vagus) slow the heart and decrease B.P. Sympathetic - increased heart rate and B.P. ! Cardiac muscles contracts rhythemically and automatically.

6) Special conducting tissues of heart

Impulse generating and impulse conducting system- SA node, AV mode, Bundle of His with Rt. and Lt. branches, Purkinje's fibers. (SA node = Pace maker of Heart)

7) Blood circulation

Lt. ventricle → Aorta → Arteries → Arterioles and capillaries → O_2 and nutrient supply to body tissues → venules → veins → superior and inferior vena cava and coronary sinus → Rt. Atrium → Rt ventricle → Pulmonary Artery → Deoxygenated blood to lungs for purification → oxygenated blood into pulmonary vein → Lt. Atrium → Lt. Ventricle.

8) Cardiac Cycle (0.8 sec) = changes during each heart beat

A) Ventricular contraction

i) Isovolumic or Isometric contraction (0.05 sec)

ii) Rapid ejection phase (0.11 sec)

iii) Reduced ejection phase (0.14 sec)

B) Ventricular diastole

i) Protodiastole (0.04 sec)

ii) Isovolumic or Isometric relaxation (0.08 sec)

iii) 1st rapid filling phase (0.116 sec)

iv) Reduced filling phase (0.167 sec) - Diastasis

v) Last rapid filling (0.1 sec) →

This vth phase co-insides with atrial contraction.

9) Definition of cardiac cycle

Due to electrical current, mechanical events occurring in heart, from beat to beat.

10) Cardiac cycle time

75 beats → in 60 sec

∴ 1 beat → in ? sec

60 / 75 = 0.8 sec = 1 cardiac cycle

11) Cardiac cycle events

	Atrial	Ventricular
i	Atrial systole = 0.1 sec	Ventricular Systole = 0.3 sec
ii	Atrial Diastole = 0.7 sec	Ventricular Diastole = 0.5 sec
	Total = 0.8 sec	**Total = 0.8 sec**

12)

A) Stroke Volume = 70 ml = Amount of Blood pumped out by single ventricle per beat

B) Minute volume = Stroke volume x Heart rate = 5 lit/min

C) End systolic volume = 60 ml
= Amount of blood remaining in ventricle at the end of systole

D) End diastolic volume = Stroke volume + End systolic volume
= 70 + 60
= 130 ml

E) $\left.\begin{matrix}\text{Ejection} \\ \text{Systolic fraction}\end{matrix}\right\} = \frac{\text{Stroke volume}}{\text{End diastolic volume}} = \frac{70}{130} = 0.5$

Note

If Ejection Systolic fraction > 0.5 = Good Heart and

If Ejection Systolic fraction < 0.5 = Weak Heart

13) Heart Sounds

	1st Heart Sounds	2nd Heart Sounds
1	AVV closure	SLV closure
2	Ventricular systole	Ventricular diastole
3	Vibrations in aorta & pulmonary Arteries	Regurgitation in aorta & pulmonary Arteries
4	LUBB	DUP
5	Pitch - Low	Pitch - High
6	Duration - More	Duration - Less
7	Best heard - at apex (5^{th} Lt. intercostal space)	Best heard - at base (2^{nd} Rt. intercostal space)
8	Best heard by Diaphragm of stetho	Best heard by 'Bell' part of stetho
9	Coinsides with carotid pulse	Comes after carotid carotid pulse

14) Nutrition of Heart

1) Rt. coronary artery
(posterior interventricular branch and marginal branch)

2) Lt. coronary artery
(Anterior interventricular branch and circumflex branch).

15) Radial Pulse

Pulse is a wave, transmitted by increased pressure, which passes along the arteries during each heart beat.

Pulse exam

i) Rate (per minute) - Adult = 70 – 80
New born = 130
upto 5 yrs = 90
upto 10 yrs = 80
upto 15 yrs = 70 – 75

ii) Rhythm – Regular / Irregular

iii) Volume – (cardiac output) uplift or amplitude,

iv) Force – Strong / Weak

v) Tension – Diastolic pressure.

vi) Condition of vessel wall.

16) Physiological variations in pulse

i) Pulse ↑ = Standing, sitting, exercise, emotional

ii) Pulse ↓ = Sleep, physical and mental rest.

17) Heart rate increase due to

Impulses from higher centers e.g. emotional excitement, voluntary deep breathing, O_2 lack (Anoxia), CO_2 excess, rise of body temperature.

18) Abnormal pulse

i) Tachycardia

(P.R > 100/min) Increased B.M.R, After meals, exercise, emotional upset, fever, Thyrotoxicosis.

ii) Bradycardia

(P.R < 60 / min) Low BMR. Increased intracranial pressure

iii) Auricular Fibrillation

P.R = 400/min

iv) Pulses alternates

Alternate weak and strong beatings in M. I.

v) Water hammer pulse

Sharp and steep rise and fall of pulse in Aoratic regurgitation.

19) Pulse can be felt at

Radial pulse (Most common)

Temporal A.	Facial A.
Common carotid A.	Brachial A.
Femoral A.	Popliteal A.
Posterior tibial A.	Dorsalis pedis A.

20) Blood pressure

Definition

B.P. is a lateral pressure exerted by blood on the unit area of vessel walls, during its flow.

Pulse pressure = S. B. P. – D. B. P.

Mean BP = $\text{D. B. P.} + \frac{1}{3}$ Pulse Pressure

B. P. depends upon

i) Cardiac output and

ii) Peripheral resistance (Elasticity of vessel, lumen of arteiole, viscosity of blood and velocity of blood.)

i) Systolic B.P. = Maximum pressure during systole and

iii) Diastolic B.P = Minimum pressure during diastole

Normal B.P. = 120 / 80 mm of Hg.

21) Physiological variations in B.P.

Age, sex, built, exercise, sleep, posture, emotion/excitement.

Age	B. P.			
	Systolic	/	Diastolic	
Infancy	70-80	/	40 - 50	mm of Hg
Childhood	90-110	/	50 - 60	mm of Hg
Puberty	110-120	/	90 - 100	mm of Hg
Old age	140-150	/	90 - 100	mm of Hg

B.P. is more in males, overweight person, during exercise (Systolic ↑), in standing position, in excitement.

B.P. is lower during sleep.

22) B. P. Apparatus = Sphygmomanometer

(Mercury, Anaeroid, Electronic, Digital)

B. P. Exam method

Palpatory, ascultatory, oscillatory.

Korotkoff sound

The various sounds that are heard, while taking B. P. in between Systolic and Diastolic (4 phases)

23) Natural mechanisms in the body for B.P. regulation

A) Baroreceptor Reflex

When B.P ↑ stretch receptors in carotid sinus and aortic arch are stimulated → Impulses transmitted to nucleus of tractus solitarius in medulla (VMC) through glossopharyngeal and vagus Nerve → They inhibit VMC - Vasodilation B. P. ↓.

B) When B.P ↓

Renal Ischemia → J.G cells are stimulated → Secrete Renin → Cause formation of Angiotensin I in Blood (from Angiotensinogen, protein substrate in liver). ACE (Angiotensin converting enzyme, synthesized by Lung) → Convert Angiotensin I to Angiotensin II. This substance, increases BP due to 3 reasons - i) Vasoconstriction

ii) Stimulate Thirst center

iii) Stimulates adrenal cortex

Aldosterone ↑- Na^+ and H_2O reabsorption ↑- Blood volume ↑ - B.P ↑

24) E.C.G. Graphical record of electrical activity of Heart.

ECG paper moves with a speed of 300 large squares per minute.

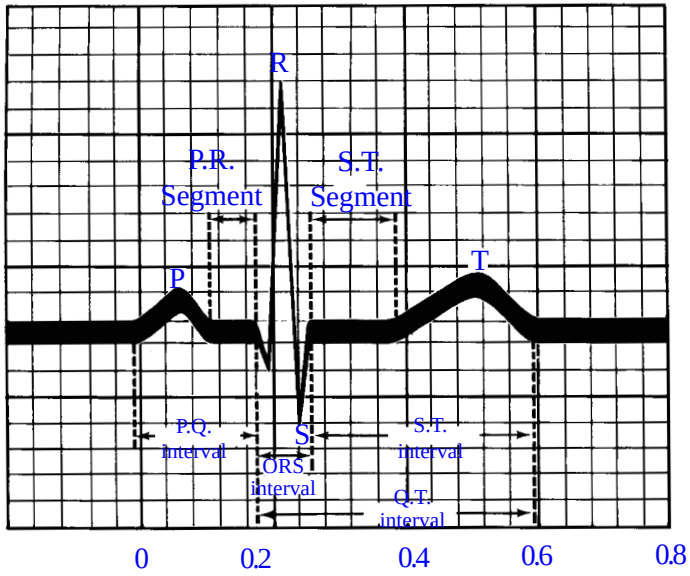
300 squares → 60 sec

1 square → 0.2 sec

5 small squares → 0.2 sec

∴ 1 small square → **0.04 sec**

25) ECG



26) ECG waves, significance and values

Waves = P, Q, R, S, T.

i) P wave = Contraction of atria

ii) QRS complex = Ventricular Depolarisation

iii) T wave = Ventricular Repolarisation.

Values

i) P wave = 0.1 sec

ii) PR interval = 0.12 sec – 0.20 sec (3 - 5 small squares)

iii) QRS complex = 0.04 sec – 0.10 sec. (1 - 3 small squares)

$$\text{Heart rate H.R.} = \frac{300}{\text{No.of large squares in R} - \text{R}}$$

27) ECG Leads (12)

i) Bipolar limb leads

Lead I (Rt. arm and Lt. arm)

Lead II (Rt. arm and Lt. leg)

Lead III (Lt arm and Lt. leg)

ii) Unipolar limb Leads

aVR (Rt. arm),

aVL (Lt. arm),

aVF (Lt.foot)

Here aV = amplified voltage

iii) Unipolar chest Leads

V_1 = 4th intercostal space, to Rt. of sternum

V_2 = 4th Inter costal space, Lt. to the sternum

V_3 = Mid-point between V_2 and V_4

V_4 = 5th Intercostal space in mid clavicular line

V_5 = Lt. 5th Intercostal space, an anterior axillary line

V_6 = Lt. 5th Intercostal space, in mid axillary line

28) ECG Findings in various cardiac problems

i) A.M.I (Acute myocardial Infarctions and leads)

Elevatioin of "ST" segment, inversion of T wave, Appearance of 'Q' wave. Infarction and leads as follows -

Anterior wall infarction → V_1, V_4, V_5

Ant. and lat. wall → V_3, V_4

Lateral surface → I, aVL, V_5 and V_6

ii) Angina Pectoris

ECG is normal at rest but ST depression in stress test.

iii) LVH

In V_5 and V_6 → Tall R wave (greater than 5 large square),

S in V1 or V2 > 25 mm, R + S > 35 mm

iv) RVH

Rt axis deviation; In V_1 → R > S, In V_6 → deep S wave.

v) Lt. axis deviation

QRS becomes positive in I and negative in III (Left leaves)

vi) Rt. axis deviation

QRS is –ve in I and +ve in III (Right reaches)

vii) 1st degree Heart block

PR prolonged. (> 0.20 sec) (> 5 squares)

viii) RBBB

Widening of QRS complex in lead V_1 and RSR' pattern.

ix) LBBB

Widening of QRS complex in V_6 and M pattern.

BP practical principal

The pressure of blood in brachial artery is balanced against the pressure in a rubber culf and then it is measured by sphygmomanometer.

7. वाक्प्रवृत्ती

1) शब्दोत्पत्ती

- **आत्मा बुध्दया समेत्यार्थान् मनो युङ्क्ते विवक्षया।**
  मनः कायाग्निमाहन्ति स प्रेरयति मारुतम्।
  मारुतस्तूरसिचरन् मंद्र जनयति स्वरम्।
  सोदीर्णा मूर्ध्यभिहतो वक्त्रमापद्य मारुतः।
  वर्णाज्जनयते तेषां विभागः पंचधा श्रृणु।
  अष्टौ स्थानानि वर्णानाम् उरः कण्ठशिरस्तथा।
  जिव्हामुलं च दंताश्च नासिकाओष्ठौच तालु च॥ **... पाणिनी शिक्षा**

2) वाक्प्रवृत्ति के संदर्भ में घटक

स्वरवह स्त्रोतस (सु. उ.),

- **जिव्हा, मुखकुहर, वायु (प्रवर्तको वाचः, प्रकृतिः शब्दस्पशयोः) उदान वायु (तेन भाषितगीतादि विशेषो अभिप्रवर्तते - सु. नि), आकाश (शब्द गुण)**

3) शब्द प्रकार

कारण भेद से - 3 (संयोगज, विभागज, शब्दज);

स्वरुप भेद से - 2 (ध्वन्यात्मक, वर्णात्मक);

स्वरुप भेद से अन्य - 2 (भाषारुप, घोषरुप)

4) वाणी के 4 प्रकार

परा, पश्यन्ति, मध्यमा, वैखरी

5) वर्णाक्षर उत्पत्ती प्रकार

कण्ठ्यम	(क, ख, ग),	तालव्य	(च, छ, ज),
मूर्ध्न्य	(ट, ठ, ड, ढ, ण),	दंत्य	(त, थ, द, ध, न),
ओष्ठय	(प, फ, ब, भ, म),	अनुनासिक	(ङ, ञ, ण, न)

6) **शब्द प्रसारण न्याय**

वीचितरंग, कदंबमुकुल

7) Speech Involves

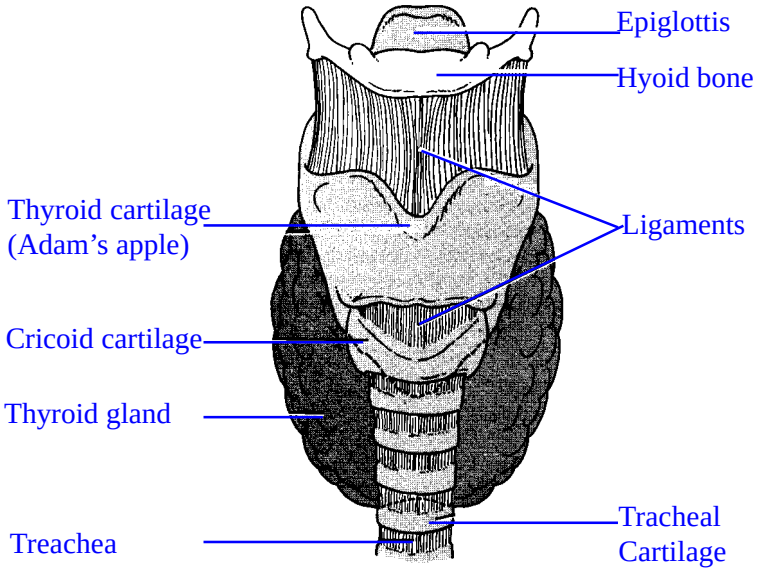
Speech Nervous control centers in cerebral cortex, respiratory control centers in brain, articulation and resonance structure in month and nasal cavities.

8) Speech

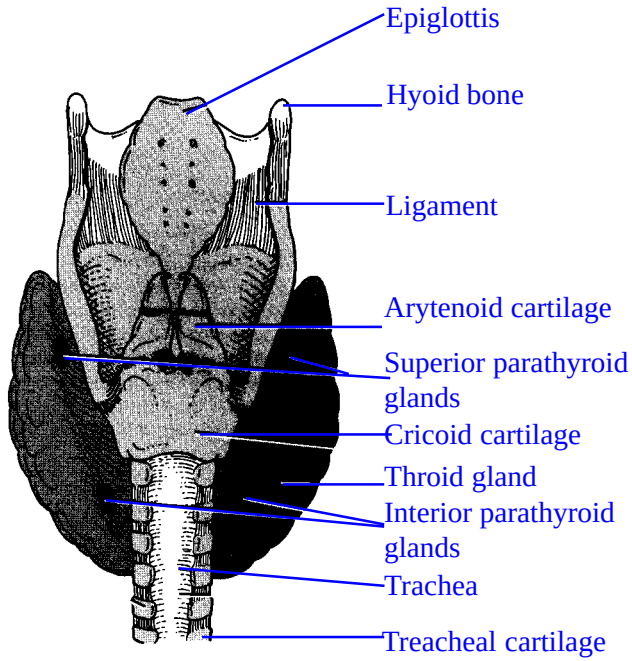
Composed of i) Phonation (Larynx)

ii) Articulation (Mouth).

9) Figure of Larynx



(a)



(b)

10) Organs of Articulation

Lips, Tongue, soft palate, Resonators → mouth, nose, nasal sinuses, pharynx, chest cavity.

11) 2 Aspects of communication

Sensory (Ears / Eyes), Motor (vocalization).

- Motor Aspect → Formation of thoughts, (Wernicke's Area - post part of superior temporal Gyrus); Motor control of vocalization
- Motor Aphasia - Damage to Broca's speech area.

8. प्रकृति

1) **प्रकृति का अर्थ**

- **प्रकृतिः शरीर स्वरुपम् ।**

2) **प्रकृति व्याख्या**

- **जन्ममरणान्तराल भाविनी अविकारिणी दोषास्थिती प्रकृती ।।**

... रसवैशेषिकसूत्र

- **दोषानुशयिता हि दोषां देहप्रकृतिरुच्यते ।।** **... च. सू.**

3) **प्रकृति निर्माण**

- **शुक्रशोणित संयोगे यो भवेत् दोषः उत्कटः प्रकृतिर्जायते तेन ।। ... सु. शा.**

4) **प्रकृति निर्माण में जिम्मेदार घटक**

शुक्र / शोणित, माता का गर्भसंभवकाल में आहार/विहार, गर्भाशय की स्थिति, गर्भधारणा का काल ।

5) **प्रकृति ज्ञान का महत्व**

स्वस्थस्य स्वास्थ रक्षणम् (प्रत्येक व्यक्ति ''उपचार स्वस्थ'' होती है ।), आतुरस्यव्याधि परिमोक्षः (दशविध परीक्षा भाव में प्रकृति का समावेश)

6) **प्रकृति प्रकार**

- **दोषज प्रकार (7)**

वात, पित्त, कफ, प्रकृति, वात-पित्त, वात-कफ, पित्त-कफ-प्रकृति, समदोषज प्रकृति

- **भौतिक प्रकृति (5)**

पार्थिव, आप्य, तैजस, वायवीय, आकाशीय ।

- **गुणमयी अथवा मानस प्रकृति**

सात्विक प्रकृति **(7)** ब्राह्म, माहेंद्र, वारुण, कौबेर, गांधर्व, याम्य, ऋषी सत्व ।

राजस प्रकृति **(6)** आसुर, राक्षस, पैशाच, प्रेत, सर्प, शाकुन ।

तामस प्रकृति **(3)** वानस्पत्य, पाशव, मात्स्य ।

- **जात्यादि सप्तविध प्रकृति**

जाति, कुल, देश, काल, वय, बल नियत प्रकृति, प्रत्यात्मनियत प्रकृति ।

7) **प्रकृति गुणवत्ता**

- समप्रकृति सर्वश्रेष्ठ ।
- द्विदोषज् - निंद्य ।
- एकदोषज में कफ उत्तम, पित्त - मध्यम, वात- हीन ।
- द्वंद्वज में पितत्तकफात्मक हीन, वातकफात्मक हीनतर ; वातपित्तात्मक हीनतम ।

8) **दोषज प्रकृति उत्कटत्व के लक्षण**

(संदर्भ - च. वि. 8/96 - 98.)

अ) **वातप्रकृति**

- **वातस्तु रुक्ष-लघु चल बहु शीघ्र शीत परुष विशदः । तस्य रौक्ष्यात् वातला रुक्ष अपचित अल्प शरीराः । प्रतत - रुक्ष - क्षाम-सन्न-सक्त-जर्जर स्वराः, जागरुकाश्च भवन्तिः, लघुत्वात् लघु चपल गति, चेष्टा, आहार, व्याहाराः, चलत्वात् अनवस्थित सन्ध्यस्थि-अक्षि-भु-हनु-ओष्ठ-जिव्हा-शिर स्कन्ध पाणि पादाः, बहुत्वात् बहुप्रलाप कण्डरा सिरा प्रतानाः, शीघ्रत्वात् शीघ्रसमारम्भ क्षोभ विकाराः, शीघ्र त्रास-राग-विरागः,श्रुतग्राहिणो अल्प स्मृतयश्च, शैत्यात-शीत असहिष्णवः, प्रतत-शीतक उद्वेपक-स्तम्भाः, पारुष्यात-परुष केश-श्मश्रु-रोम नख-दशन वदन पाणि पादाः, वैशद्यात् स्फुटित-अंग अवयवः सतत सन्धिशब्द गामिनश्च भवन्ति, त एवं गुणयोगात् वातलाः प्रायेण अल्पबलाःच अल्पायुषश्च, अल्पअपत्यः च, अल्प साधनाश्च, अल्प धनाः च भवन्ति ।।**

ब) पित्त प्रकृति

- **पित्तं उष्णं-तीक्ष्णं -द्रवं- विस्त्रं-अम्लं-कटुकं च। तस्य औष्ण्यात् पित्तला भवन्ति उष्ण असहा, उष्णमुखाः, सुकुमार अवदात गात्राः, प्रभूत पिप्लु-व्यंग-तिल कालकाः, क्षुत्-पिपासावन्तः, क्षिप्र वली-पलित-खालित्यदोषाः। प्रायो मृदु-अल्प-कपिल श्मश्रु-लोम-केशाः च, तैक्ष्ण्यात् तीक्ष्ण पराक्रमाः, तीक्ष्ण अग्नयः, प्रभूत अशनपानाः, क्लेश असहिष्णवो, दन्दशूकाः, द्रवत्वात् शिथिल मृदु सन्धिमांसाः, प्रभूत सृष्ट स्वेद-मूत्र-पुरीषाश्च, विस्त्रवात् प्रभूत पूति वक्ष कक्ष-अस्य-शिरः, शरीरगन्धाः, कटु-अम्लवात्-अल्प शुक्र-व्यवाय-अपत्याः, त एवं गुणयोगात् पित्तला मध्यबला, मध्यायुषः, मध्य ज्ञान विज्ञान वित्त-उपकरणवन्तः च भवन्ति॥**

क) कफ प्रकृति

- **श्लेष्मा हि स्निग्ध श्लक्ष्ण मृदु-मधुर-सार-सान्द्र-मन्द-स्तिमित-गुरु -शीत-विज्जल-अच्छः। तस्य स्नेहात् श्लेष्मलाः स्निग्धांगः, श्लक्ष्णत्वात् श्लक्ष्णांगाः, मृदुत्वात-दृष्टिमुख सुकुमार अवदातगात्राः, माधुर्यात् प्रभूत-शुक्र-व्यवाय अपत्याः, सारत्वात सार-संहत-स्थिर शरीराः, सांद्रत्वात् उपचित-परिपूर्ण-सर्वगात्राः, मन्दत्वात् मन्द-चेष्टा आहार-व्याहाराः, स्तैमित्यात् अशीघ्र-आरम्भ-क्षोभ-विकाराः, गुरुत्वात्-साराधिष्ठित अवस्थित गतयः, शैत्यात्-अल्पक्षुत्-तृष्णा-संताप-स्वेद-दोषाः, विज्जलत्वात -सुश्लिष्ट-सार-सन्धिबन्धनाः, तथा अच्छत्वात्-प्रसन्न दर्शन आननाः, प्रसन्न स्निग्ध वर्ण स्वराश्च भवन्ति। त एवं गुण योगात् श्लेष्मला बलवन्तो वसुमन्तो विद्यावन्तः, ओजस्विनाः आयुष्यमन्तः च भवन्ति॥**

9) अनुक

शील, आचरण, कुल अथवा वंश।

वात अनुकत्व

अजानूक (बकरी), गोमायु (कोल्हा), शश (खरगोश), आखु (चूहा), उंष्ट्र (ऊँट), श्वा (कुत्ता), गृध्र (गीदड), काक (कौआ), खर (गधा)।

पित्त अनुकत्व

गन्धर्व, यक्ष, व्याघ्र, ऋक्ष (भालू), मार्जर (बिल्ली), वानर, नकुल (नेंवला), भुजंग (सर्प), उलूक (उल्लू)।

कफ अनुकत्व

ब्रह्मा, रुद्र, इंद्र, अश्व, शेर, गज, गोवृष (बैल), ताक्षर्य (गरुड), हंस

10)

अ) सात्विक प्रकृती

आनृंशस्य, संविभाग रुचिता, तितिक्षा (क्षमा), सत्य, आस्तिक्य, ज्ञान, बुद्धि, मेधा, धैर्य,अनभिषंग

ब) राजस प्रकृती

दुःख बहुलता, अटनशीलता, अधृति, अहंकार, आनृतिकत्व (असत्य), अकारुण्य, दंभ (ढोंगी), मान, हर्ष, काम, क्रोध

क) तामस प्रकृती

विषादित्व (मूढता), नास्तिक्य, अधर्मशीलता, दुष्ट बुद्धि, अज्ञान, दूर्मेधस्त्व, अकर्मशीलता, निद्रालुत्व.

11) प्रकृतिनुसार आरोग्य सलाह

जिस दोष की प्रकृति हो, उस दोष के गुणों के विरोधी आहार-विहार सेवन करें। उदा.- पित्त प्रकृति ने शीत गुणात्मक दुग्ध, गुलकंद, थंड वातावरणात में रहना आदि।

12) प्रकृति परीक्षण के मुद्दे

रचनात्मक (८ मुद्दे)

शरीर - शरीरअवयव, दंत - नेत्र, त्वचा/वर्ण - केश/श्मश्रु, नख - संधि

क्रियात्मक (११ मुद्दे)

क्षुत्-तृट्, हलचल (गतिविधि)-वाणी, निद्रा-स्वप्न, अभिरुची-अनभिरुची (साम्य-असाम्य), बल-अग्नि, मलद्रव्य स्वरुप

मानस (४ मुद्दे)

बुद्धि-स्मृति, स्वभाव-सौहृद,

अन्य मुद्दे

विकार, अनुकत्व

9. चिकित्साधिष्ठित पुरुष

1) **व्याख्या**

चिकित्सा का अधिष्ठान होने वाला अथवा जिस पर चिकित्सा की जाती है, वह घटक (पुरुष)।

2) **चिकित्साधिष्ठित पुरुष के प्रकार अथवा वर्गीकरण**

- एकधातुक पुरुष (चेतना)
- त्रिधातुक पुरुष (सत्व, आत्मा, शरीर)
- पांचभौतिक पुरुष
- **षड्धातुक पुरुष -(खादयश्चेतना षष्ठा धातवः पुरुषः स्मृतः। ... च. शा.**
  - चतुर्विंशतिक पुरुष (प्रकृति + पुरुष, महत्,
    अहंकार → सात्विक - राजस - तामस),
  - 5 ज्ञानेंद्रिय, 5 कर्मेंद्रिय, मन, 5 तन्मात्रा, 5 महाभूत
  - राशि पुरुष,
  - संयोग पुरुष
  - कर्म पुरुष

10. षट्क्रियाकाल

1) **6 काल**

- **संचयं च प्रकोपं च प्रसरं स्थानसंश्रयम् व्यक्ति भेदं च यो वेत्ति दोषाणां स भवेद् भिषक्॥ ... सु. सू.**

2) **व्याख्या**

- क्रिया का अर्थ है - चिकित्सा करने के छह (6) काल।
- दोषप्रकोपक कारणों के सेवन से ले कर, व्याधिनिर्मिती होने तक की छह (6) महत्वपूर्ण घटनाएँ।

3) **चय अवस्था**

- **तत्र संचितानां खलु दोषाणां स्तब्धपूर्णकोष्ठता, पीतवभासता, मंदोष्मता च अंगानां गौरवम् आलस्यं, चय कारण विद्वेषश्चेति लिंगानि भवन्ति।**
- **चय एव जयेत् दोषम्।**

4) **प्रकोप अवस्था**

- **तेषां प्रकोपात् कोष्ठ तोद संचरण, अम्लिका, पिपासा; परिदाह अन्नद्वेष, हृदयोत्क्लेदश्च जायन्ते॥**

5) **प्रसर अवस्था**

- **एवं प्रकुपितानां प्रसरतां च वायोर्विमार्गमन आटोपौ, ओषचोष परिदाह धूमायनानि पित्तस्य, अरोचक अविपाक-अंगसाद छर्दिश्चेति श्लेष्मणो लिंगानि भवन्ति॥**

6) **स्थानसंश्रय**

- **स्थानसंश्रयिणा कृध्दाः भाविव्याधि प्रबोधकम्।**

  दोषाः कुर्वन्ति यत् लिंग पूर्वरुपम् तदुच्यते॥ ... मा. नि. १

7) **व्यक्ती अवस्था = व्याधिदर्शन अवस्था**

व्याधि प्रत्यात्म लक्षण प्रवाहिका = प्रवाहमाणस्य प्रवाहिका।

कामला = कामान् लाति इति कामला।

ग्रहणी = मुर्हुद्रवं मुर्हुबध्दं।

8) **भेद**

व्याधि का दोषज प्रकार स्पष्ट (अंशाश कल्पना)।

9) **षट्क्रिया काल ज्ञान का महत्व**

सुयोग्य संप्राप्ती ज्ञान, चय एवं जयेत् दोषम्, व्याधि निर्मिति के विभिन्न स्तरों में यथायोग्य चिकित्सा (उदा. स्थानसंश्रय अवस्था में - स्थानानुसार रसायन चिकित्सा), चिकित्सा अधिक फलदायी।

11. आहार (Food)

1) **आहार सेवन के लाभ**

- **प्राणाः प्राणभृतानाम् अन्नं, अन्नं लोकोभिधावति।**
  वर्णप्रसादः सौस्वर्यं जीवितं प्रतिभा सुखम्।
  तुष्टिः पुष्टिर्बलम् मेधा सर्वम् अन्ने प्रतिष्ठितम्। **... च. सू.**

2) **आहार द्रव्य वर्गीकरण**

- उत्पत्ती भेद से - जांगम, औद्भिद, पार्थिव।
- स्वरुप भेद से - सेंद्रिय, निरेंद्रय।
- शरीर परिणाम स्वरुप - हितकर/अहितकर तथा शमन/कोपन/स्वस्थाहित।
- गुर्वादि गुणों के अनुसार 20 प्रकार।
- षड् रसात्मक।
- पांचभौतिक आहार।
- शुक (एकदल), शिंबी (द्विदल), शाकवर्ग, फलवर्ग, मांसवर्ग।
- सेवन प्रकार - भक्ष्य, अशन, लेह्य, पेय।

3)

रस	परीक्षण	कार्य	अतियोग
मधुर	इंद्रियाणि प्रसादयति देह प्रल्हादयति, षट्पद पिपीलिकानां इष्टतमः	जन्म प्रभृति साम्यात्, सर्वधातु विवर्धनः, प्रीणनः, बृहणः, जीवनः तर्पण	स्थौल्य,अग्निसाद, अतिनिद्रा, श्वास, प्रमेह, पीनस, लोचनगद, क्रिमी

रस	परीक्षण	कार्य	अतियोग
अम्ल	जिव्हां उद्वेजयति, मुखं स्त्रावयति, अक्षिभ्रुवं संकोचयति, उरः, कंठ विदहति	अनुलोमनः, रोचनः, पाचनः, दीपनः, स्निग्धः हृद्यः च।	कण्डु, पाण्डुता, रक्तपित्तं, पिपासां, श्वयथुं
लवण	कंठ कपोल, विदहति अन्नं प्ररोचयति	संघात -विध्मापनः, रोचनः पाचनः, भेदनः, छेदनः	खलित पलित, श्वयथु, कोठ, अस्त्रपित्तम्, वातरक्तं
कटु	भृशं उद्वेजयति, जिव्हा अग्रं चिमचिमायति, मुख अक्षि नासिकं विदहति	पाचनः, दीपनः, क्रिमि-विष कण्डु प्रशमनः।	तृष्णा, मूर्च्छा, बल, शुक्र उपशोष, अतिकर्शनानि संकोच, तोद, भेदैः
तिक्त	विशदयति वदनं, प्रतिहन्ति रसनम्।	स्वयं अरोचिष्णु अपि, अरुचि, विष, क्रिमि, ज्वर, दाह, कण्डु हरः। मेध्यः, शीतः	बलक्षय, भ्रम, वातरोग
कषाय	जडयति जिव्हां, बध्नाति कंठ, पीडयति हृदयम्	पित्तं रक्तं निहन्ति क्लेदशोषी, हिमः, प्रीणनः, रोपणः	शुक्र उपरोधं, विष्टंभ, कार्श्यम् पक्षाघात, आक्षेपक

4) **हितकर द्रव्य (अ. ह. सू.)**

शालि, गोधूम, आमलक, मुद्ग, शर्करा, घृत, क्षीर, क्षौद्र, दाडिम, सैंधव।

5)

	रस	ऋतु में अधिक्य	महाभूत संघटन
1	मधुर	हेमंत	पृथ्वी + जल
2	अम्ल	वर्षा	पृथ्वी + तेज
3	लवण	शरद	जल + तेज
4	कटु	ग्रीष्म	वायु + तेज
5	तिक्त	शिशिर	वायु + आकाश
6	कषाय	वसंत	वायु + पृथ्वी

6) Food - Definition

Any substance, when taken into body can be used to

i) Yield Heat or energy

ii) Build up new tissues

iii) Repair worn out tissues

iv) Regulate body processes

v) Production of important body compounds

7) Proximal principles of food

i) Carbohydrates ii) Fats iii) Proteins
iv) Mineral salts v)Vitamins vi) Water

8) Sources and functions

i) Carbohydrates (starches)

Wheat, rice, maize, barley, potatoes.

Sugars

Sugar cane, beet root, fruits

Functions

Chief source of energy (stored as glycogen in liver and muscles)

Daily Need

400 - 500 gms.

ii) Fats (Triglyceride) - Glycerol + Fatty acids

Butter, Ghee, Vegetables and Hydrogenated oil

Functions

i) Fats

Protection, insulation, source of energy.

ii) Phospholipids

a) Lecithin - Component of cell membrane and plasma

b) Cephalin - Found in Nerves and brain tissue

iii) Steroids

a) Cholesterol - Constituent of cells, blood and nervous tissue; precursor of Bile salt, vit D and steroid hormone.

b) Bile salts - Emulsification of fats and needed for absorption of fat soluble vitamins.

c) Estrogens and Androgens - Sex hormones in females and males respectively.

iii) Lipoid substances

a) Carotens - Necessary for formation of vitamin A

b) Prostaglandins - Membrane associated lipids that stimulate uterine contractions, regulate B.P.

Daily need - 45 to 60 gms.

iii) Proteins

Milk, Pulses, Soya beans, eggs, meat, nuts, legumes

Function

i) Structural - Form the structural frame work of various parts of body (Keratin in hair, collagen in connective tissue)

ii) Regulatory - Hormones (Insulin)

iii) Contractile - Elements of muscle tissue (Actin and Myosin)

iv) Immunological - Gamma globulins (IgG, IgA, IgM, IgD, IgE)

v) Transport - Hb

vi) Catalytic - Enzymes (salivary amylase, lipase)

Daily need - 1 gm / Kg body wt.

9) Salts - source and function

	Salt	Source	Function	Daily Need	Deficiency
1	Ca	Milk, eggs, dried beans	Constituent of bones and teeth, Rhythmic activities of heart, contractile muscles	1 Gm - Adult 1.5 Gm - Lactating mother	Poor development of bones and teeth, rickets, osteomalacia, Delayed Blood coagulation.
2	Phosphorus	Yolk of eggs, milk, Nuts, almonds	Essential for multiplication of cells and growth	1.5 Gm	Softening of bones, caries of teeth, stunted growth
3	Iron	Pulses,cereals, onions, dates, Figs, dried fruits	Main constituent of Hb. Imp role in oxidation and catalysis of enzymes	15 mgm	Anaemia
4	Iodine	Yolk of Eggs, onions, vegetables, salt	Essential constituent of Thyroid Gland	150 mgm	Goitre

5	NaCl	Salt	Maintains osmotic pressure in blood and other tissue fluids. Maintains PH ion concentration.	10 - 15 gm	Cramps, marked Weakness, mental lassitude.

10) Fat Soluble Vitamins (A, D, E, K)

	Vitamin	Source	Function	Daily Need	Deficiency
1	A	Milk, butter, Ghee, green and yellow vegetables, carrots, Mangoes, cabbage, papaya	Maintaining Integrity of epithelial lining, anti-infective and growth promoting.	5000 I. U.	Xerosis, Xerothalmia, dryness of skin (toad skin), night blindness, retards growth and lowers resistance to bacterial infection.
2	D (Anti Rachitic vitamin)	Calciferol (D2) is produced in skin by action of ultraviolet rays of sun, egg yolk, cod liver, oil, butter, fat, ghee	Calcification of bones and teeth	400-1000 I.U.	Rickets (children) osteomalacia (Adult)

3	E (Anti sterility vitamin)	Wheat, cereal, vege-table oil, tocopherol (oil extracted from wheat germ)	Main constituent of Hb. Imp role in oxidation and catalysis of enzymes	Death of foetus in uterus, sterility in males and females (in lower animals)
4	K (Coagu-lation vitamin)	Green leaves, spinach, cauliflower, cabbage, soya bean oil	Essential for normal coagulation. Formation of prothrombin.	Hypo-prothrombinemia, Haemorrages in skin and sub cutaneous tissue. (B.T ↑)

11) Water soluble Vitamins (B, C, D)

Vitamin	Source	Function	Daily Need	Deficiency
1 B1 (Thiamine)	Rice (unpolished), pulses, cereals, egg yolk	Essential for growth and Health of body	2 mg	Beriberi, Neuritis, Anaemia, Mental depression.
2 B2 (Riboflavine)	Milk, eggs, yeast	Essential for normal fat metabolism	2-3 mgm	Angular stomatitis, Glossitis, Dermatitis, Burning, Itching.
3 P. P. (Pellagra preventing factor/ Nicotinic acid	Mangoes, Meat	Maintain Healthy condition of skin and mucous membrane	15-30 mg	Pellagra, Dermatitis, mental depression, dementia.
4 B6 (Pyridoxine) Anti-Dermatitis vitamin	unpolished rice, wheat, peanuts, yolk of eggs, yeast	Essential for normal protein metabolism and for Hb synthesis	-----	Muscular Dystrophy, rigidity
5 H (Biotin)	Cereals, eggs, yeast	Related to fat and carbohydrate metabolism	150 mgm	Dermatitis, Eczema.
6 M (folic acid)	Leafy vegetables, yeast	Stimulates formation of WBC, Imp for haemopoetic factor.	-----	-----

7 Inositol (mouse-anti-alopecia factor)	-----	Metabolism or transport of fat	-----	Loss of hair
8 B 12 Anti-pernicious factor) (Cynoco-balmin)	-----	Imp for Hb formation and erythropoiesis	-----	Pernicious Anaemia (megaloblastic Anaemia)
9 Panto-thenic acid	-----	-----	3 - 4 mg	Burning of soles and palms, dermatitis and defective vision.
10 Choline	-----	-----	2 gm	Deposition of fat in liver, degeneration of liver and kidney

11 Vitamin C (Anti scorbutic vitamin)	Fresh fruits, oranges, lemons, **Amla**, tomatoes, fresh green, vegetables.	Essential for maintaining capillary integrity, and formation of intercellular substance, essential for maturation of RBCs	50-100 mg	Scurvy, Anaemia, spongy gums, Delaying healing of wounds, Haemogrrhages.
12 P	Occurs along with vit C, in fresh fruits, lemons and fresh salads	Helps in preventing capillary permeability.	-----	Purpura, spontaneous capillary haemorrhages.

12) Calories

i) 1 gm of Proteins, carbohydrates and fats yields - 4.1, 4.1, 9.3 calories of heat on oxidation **respectively**.

ii) Daily calories required by an Adult = 2500 – 3000 cal. (60% from carbohydrates 25% from fats and 15% from proteins.)

12. अन्नपचन (Digestion)

1) **पचन = परिणमन, परिवर्तन, बदलाव (विजातीय → सजातीय)**

२) **अग्नि – १३ प्रकार → १ जाठराग्नि + ७ धात्वग्नि + ५ भौतिकाग्नि**

	अग्नि	पित्त
1	अग्नि पित्तांतर्गत उष्मा (अग्निरेव शरीरे पित्तांतर्गत)	-----
2	महाभूत कारण द्रव्य	अग्निगुणभूयिष्ठ पांचभौतिक कार्यद्रव्य
3	समायिक-उष्ण, तीक्ष्ण गुण	उष्ण, तीक्ष्ण इतर गुण - सस्नेह, विस्त्र,द्रव
4	जाठराग्नि-अत्यंत सूक्ष्म	पित्ताला रंग, रस (अम्ल, कटू), गंध (विस्त्र), द्रवता आहे.
5	पचन समाईक कार्य	पचन व अन्य कार्ये उष्णता नियंत्रण, प्रभा.
6	घृत से अग्नि ↑ बकरी का दूध - अग्नि ↓ दिन में सोना - अग्नि ↓	घृत से → पित्त शमन बकरी का दूध - पित्त ↑ दिन में सोना - पित्त ↑

3) **अग्निम् जरणशक्त्या परीक्षेत्।**

अग्नि परीक्षण - जरणशक्ती तथा अभ्यवहरणशक्ती।

आहार पचन के लक्षण

- उद्गार शुध्दी उत्साहो वेगोत्सर्गो यथोचिताः।
  लघुता-क्षुत्पिपासा जीर्णाहारस्य लक्षणम्॥ ... मा. नि

4) **अन्नपचन अवयव एवं दोष विचार**

- जिव्हा (रसज्ञान), दंत (जर्जरितम्), अन्नवहानां स्त्रोतसां आमशयो मूलं वामं च पार्श्वम्। आमपक्वाशयांतेषु बस्तौ च सुषिराः खलु। षष्ठी पित्तधरानाम या कला परिकीर्तिता पक्व आमाशयमध्यस्था ग्रहणी सा प्रकीर्तिता॥ ... सु. उ.
- पंचमी पुरीषधरा नाम या अन्त कोष्ठे मलम् अभिविभजते पक्वाशयस्था।
  ... सु. शा.
- यकृत (रक्तवह स्त्रोतस मूलस्थान एवं रक्त -पित्त (पचन) संबंध)

पचन दोष विचार

प्राणवायु
- निश्वास अन्न प्रवेशकृत्।

समानवायु
- अन्नं गृण्हाति पचति विवेचयति मुंचति।

अपानवायु
- शुक्र आर्तव शकृत-मूत्र गर्भ निष्क्रमणक्रियः।

पाचक पित्त
- पंचभूतात्मकत्वे अपि यत् तेजस गुणोदयात्।
  त्यक्तद्रवत्वे पाकादि कर्मणा अनल शब्दितम्।
  पचति अन्नं विभजते सारकिट्टौ प्रथक् तथा॥

बोधक कफ
- रस बोधनात्। बोधको रसना स्थायी

क्लेदक कफ
- यस्तु आमाशय संस्थितः।
  क्लेदकः स अन्न संघात क्लेदनात्।

5) **अवस्था पाक (च. चि. अ. 15)**

प्रथम – मधुर अवस्था पाक (अविदग्धावस्था)

अन्नस्य भुक्तमात्रस्य षड्रसस्य प्रपाकतः।
मधुराद्यात कफोद्भावात फेनभूत उदीर्यते॥

द्वितीय – विदग्धावस्था / अम्ल अवस्था पाक

परंतु पच्यमानस्य विदग्धस्याम्लभावतः।
आशयाच्चवमानस्य पित्तम् अच्छम् उदीर्यते॥

तृतीय – पक्वावस्था / कटु अवस्थापाक

पक्वाशयं तु प्राप्तस्य शोष्यमाणस्य वन्हिना।
पारिपिण्डित पक्वस्य वायुःस्यात् कटुभावतः॥

6) **विपाक**

- **जाठरेण अग्निना योगात् उदेरिति रसान्तरम् ।**
  आहारस्य परिणामान्ते य विपाक इति स्मृतः ।।

7)

रस	विपाक	कार्य
मधुर, लवण	मधुर	सृष्टविण्मूत्र, शुक्रल, कफकर
अम्ल	अम्ल	सृष्टविण्मूत्र, शुक्रघ्न, पित्तकर
कटु, तिक्त, कषाय	कटु	बध्दविण्मूत्र, शुक्रघ्न, वातकर

8)

	अवस्थापाक	विपाक
1	अन्नपचन की 3 अवस्थाएँ	अन्नपचन संपूर्णतः संपन्न होने के बाद की अवस्था
2	अस्थायी घटना	स्थायी घटना
3	अपूर्ण जाठराग्निसंस्कार	पूर्ण अग्निसंस्कार
4	महत्व कालसापेक्ष	कालसापेक्षता नहीं होती
5	स्थानसापेक्ष	स्थानसापेक्षता नहीं होती
6	किसी भी अन्न के तीनों अवस्थापाक होते ही है	किन्तु विपाक एक ही प्रकार का होता है
7	रस सापेक्ष नहीं होता	रस सापेक्ष होता है
8	अवस्थापक प्रथमतः	विपाक, अवस्थापाक के पश्चात

9) **कोष्ठ**

अंतडीयों की संवेदनक्षमता ।

दोष	कोष्ठ	स्नेहन कालावधी	विरेचन द्रव्य
वात	क्रूर	7 दिन	जयपाळ कल्प → अश्वंकचुकी, ईच्छाभेदी, नाराचरस
पित्त	मृदु	3 दिन	दुग्ध, द्राक्षरस, मूँग की खिचडी
कफ	मध्य	5 दिन	त्रिफला
सम	मध्य	-----	-----

10) **धातु प्रकार**

- पोषक = अस्थायी = मार्गग = परिणाम आपद्यमान
- पोष्य = स्थायी = मार्गस्थ = परिणत

11) **धातु पोषण**

- **रसात् रक्त, तंतो मांस, मांसान्मेद स्ततो अस्थि च ।**
  अस्थ्नो मज्जा ततः शुक्र शुक्राद्गर्भः प्रजायते ।।
- **संतत्या भोज्य धातूनां परिवृत्तिस्तु चक्रवत् ।।** **... च. चि. १५**

Digestion

12) Digestive tract

Oral cavity, pharynx, oesophagus, stomach, small intestine (Duodenum, jejunum, ileum), large intestine (caecum, ascending - transverse - descending - iliac - sigmoid colon), Rectum, Anus.

Accessory organs

Salivary glands, Liver, Pancreas.

13) Anatomical features

i) Oesophagus

2 cm in diameter

ii) Stomach

J shaped, cardiac and pyloric orifice, fundus-Body- Pylorus, lesser and greater curvatures

iii) Small intestine (21 ft)

Duodenums – 1 ft, Jejunum – 8 ft,

Ileum – 12 ft, Ileum – villi, for absorption,

large Intestine – 4 ft.

	Salivary Gland	Duct	Open at
1	Sub mandibular	Wharton	Side of frenum of Tongue
2	Parotid	Stenson's	2nd upper molar
3	Sublingual	Duct of Rivinus of Bartholin's	Side of frenum of tongue

14) Movements in G. I. Tract

i) Mastication

ii) Deglutition

iii) Gastric → peristalsis

iv) Small Intestine → segmentation or churning, peristalsis, anti-peristalsis, pendular

v) Large Intestine

Peristalsis, anti-peristalsis, mass peristalsis, rhythmic tonic movements.

15) Functions Done By movements in G.I. tract

i) Convert food into fine particles.

ii) Onward passage of food.

iii) Thorough mixing.

iv) Proper absorption

v) Ensure active blood and lymph circulation

vi) Excrete waste products.

16) Function of Saliva

i) Protects lining of oral cavity

(By keeping it moist and diluting the irritants)

ii) Makes-speech easier

iii) Helpful for taste sensation by dissolving and keeping the constituents in solution.

iv) Lubricates food- facilitates the act of mastication and swallowing

v) Keeps mouth and teeth clean and free from food debris. Bactericidal action of lysozymes in saliva.

vi) Bicarbonates and phosphates act as buffer

17) Function of Gastric Juice

i) HCl is Antiseptic, Activates **Pepsinogen**, provides acidic medium for the action of enzyme, Fe^{3+} (Ferric) is converted to Fe^{2+} (Ferrous) due to action of HCl

ii) Pepsinogen $\xrightarrow{HCl}$ Pepsin

Proteins $\xrightarrow{Pepsin}$ Peptone and Proteoses

iii) Intrinsic factor

Essential for vitamin B12 absorption from Intestine

iv) Mucin

Protects the mucosa, against acidity

v) Gastric Lipase

Splits the short chain Triglycerides in butter fat molecules found in milk.

vi) The Infant stomach also secretes **Rennin** which with Ca+ act on **Casein** of milk to produce curd.

vii) Some toxins and Heavy metals are excreted in gastric juice.

18) Functions of Pancreatic Juice

i) $NaHCO_3$ and Na_2CO_3 help to neutralise the acids of gastric juice.

ii) Digestive functions

a) Trypsinogen $\xrightarrow{\text{Enterokinase (Int–Juice)}}$ Trypsin

b) Chymotrypsinogen $\xrightarrow{\text{Trypsin}}$ Chymotrypsin

c) Peptone & Proteoses $\xrightarrow{\text{Chymotrypsin}}$ Dipeptide stage

d) Starch $\xrightarrow{\text{P–Amylase}}$ Dextrins and maltose

e) Triglycerides $\xrightarrow{\text{P–Lipase}}$ FFA + Glycerol
(free fatty acids)

f) Trypsin inhibitor

Keeps enzymes in inactive form inside the pancreas.

19) Functions of Intestinal juice

a) Simpler Peptides $\xrightarrow{\text{Erepsin}}$ Amino acids

b) Nucleo proteins $\xrightarrow[\text{Nucleotidase}]{\text{Nuclease, Nucleosidease}}$ Amino acids

c) Arginine $\xrightarrow{\text{Arginase}}$ Urea and ornithine

d) Maltose $\xrightarrow{\text{Maltase}}$ 2 molecules of glucose

e) Lactose $\xrightarrow{\text{Lactase}}$ 1 molecule of glucose and Galactose each

f) Fats $\xrightarrow{\text{Lipase}}$ Fatty acid and Glycerol

g) Enterokinase

Activates trypsinogen and chymotrypsinogen.

20) Functions of Bile

i) Excretion of Bile pigments (Bilirubin and Biliverdin) and other waste products.

Bilirubin → Urobilinogen — Uroblin — Urine
Bilirubin → Sterocobilinogen — Stercobilin — Stool

ii) Bile salts - emulsification of fat (surface area is increased for Lipase action)

Bile salts - Sodium → Taurocholate and Glycocholate
Potassium → Taurocholate and Glycocholate.

iii) Bile salts are useful for digestion of fat soluble vitamins (A, D, E, K)

iv) Bile helps to keep cholesterol in solution.

v) Bile salts stimulate peristalsis and so act as laxatives.

vi) Mucin of Bile → lubricating action

vii) Bile helps to neutralize the acidic reaction of Gastric juice.

21) Functions of large Intestine

i) Absorption of water

ii) Formation and passage of faeces

iii) Mucus → Lubricant

iv) No active digestion. But glucose, saline, drugs (paraldehyde) introduced intra rectally are absorbed.

v) Bacteria, present in colon synthesize vitamin K and Folic acid.

vi) Bacterial flora → also act on unabsorbed carbohydrates, fat and proteins → Fermentation and putrefaction → Indole and skatole (faecal odor)

22) End product of digestion and absorption

i) Stomach – Absorption of water, Alcohol, Glucose and simple salts.

ii) Proteins – Amino acids and carbohydrate → Glucose → Absorbed by villi (Number 5 million, surface area = 10 sq. meter) – enter into blood stream (portal circulation)

iii) Fats – Fatty acids and glycerol. Fatty acids absorbed through lacteals into lymphatic vessels → ultimately into Blood circulation.

23) Functions of Liver

i) About blood and circulation

- RBC formation in fetal life and RBC destruction in Adult
- Store house of blood (regulates blood volume)
- Manufacture **Prothrombin** and **Fibrinogen**. Therefore essential for blood clotting Mast cells form Heparin → prevent intravascular clotting
- Related to activity of R.E system in Immune mechanism
- Transfers blood from portal to systemic circulation
- Manufactures all Plasma Proteins
- Stores Iron, haematinic factor (Vit. B12), Cu, and so, helps in formation of RBC, Hb.

ii) Manufactures Bile

Emulsify the fat

iii) Relation in Carbohydrate Metabolism

- Stores carbohydrate in the form of glycogen. Imp part in Blood Sugar regulation

- Manufactures fats from carbohydrates.
- Main seat of alcohol metabolism.

iv) Relation in fat metabolism

- Stores fat, and fat-soluble vitamins
- Helps in oxidation of fat
- Site of synthesis of cholesterol from acetate
- Seat of ketone body formation

v) Relation in protein metabolism

- Plasma proteins (except immune globulin) are manufactured here
- Seat of nitrogen metabolism and formation of urea and uric acid.

vi) Hormone metabolism

- Inactivation of Insulin, Glucagons, ADH
- Reduces circulating Adrenal cortical and sex hormones by degradation and conjugation.

vii) Relation with Vitamins

- Manufactures prothrombin with help of vit K.
- Form vit A from carotene and stores it
- Storage of vit B 12
- Folic acid deficiency occurs in chronic liver diseases.

viii) Excretory function

Certain Heavy metals, various toxins, bacteria, drugs, cholesterol and Bile pigments are excreted in Bile pigments. This is Detoxicating and protective function.

ix) Liver produces large amount of Heat and takes part in Heat Regulation.

Liver

Largest organ and well-equipped Biochemical laboratory.

24) **अच्छ पित्त**

- **द्वितीय अवस्थापाक में उदीरण,**

अघनम्	**... च. चि.**
केवलम्	**... सु. शा.**
तनु	**... सु. सू**
निर्मलम्	**... च. शा.**

25) **लसिका**

- **पित्तदोष का स्थान, व्रणगतम् उदकम्** **... अ.हृ.**

शरीरस्य जलस्य पिच्छिलो भागः **... च. सू.**

यत्तु त्वगन्तरे व्रणगतमुदकं तत् लसिका शब्दं लभते **... च. शा.**

त्वगाश्रयो जलप्रायो रसमलः। **... अ.हृ.**

26) Protein digestion enzymes

Pepsin, trypsin, chymotrypsin, erepsin, renin

27) Carbohydrate digestion enzymes

Salivary amylase, pancreatic amylase, lactase, maltase, arginase

28) Fats digestion enzymes

Gastric lipase, pancreatic lipase, intestinal lipase

13. धातु – विचार

1) **धातु पोषण न्याय**

संदर्भ – • चरक टीकाकार - चक्रदत्त/गंगाधर,

• सुश्रुत टीकाकार - डल्हण/शिवदास

१) **केदारकुल्यान्याय**

अंशांश परिणाम पक्ष - वहनप्रक्रिया सूचित (Transport mechanism)

२) **क्षीरदधिन्याय**

क्रम परिणाम पक्ष = सर्वात्म परिणाम पक्ष = परिणमन प्रक्रिया सूचित (Transformation / Digestion)

३) **खलेकपोतन्याय**

पृथक् परिणमन चुनाव प्रक्रिया सूचीत (Selective Absorption)

2)

- **धातवो हि धात्वाहाराः प्रकृतिम् अनुवर्तन्ते।** **... च. सू.**

१) रस —(पित्तोष्मणा)→ रक्त

२) रक्त —(वायु अम्बु - तेजसा / रक्तम् उष्मणा)→ मांस

३) मांस —(ख तेज अम्बु गुण / स्निग्धोद्रिक्तं)→ मेद

४) मेद —(पृथ्वि अनिलादीनांसंघातः)→ अस्थि

५) अस्थि —(सौषिर्यम् अस्थ्नांमध्ये / मेदसस्तानि पूर्यते)→ मज्जा

६) मज्जा —(मज्ज्ञस्तु यः स्नेह)→ शुक्र

3)

	धातु	उपधातु	मल
1	रस	स्तन्य, रज	कफ
2	रक्त	सिरा, कंडरा	पित्त
3	मांस	वसा, षट्त्वचा	ख मल
4	मेद	स्नायु, संधिबंध	स्वेद
5	अस्थि	दंत (शारंगधर)	केश, लोम, नख, श्मश्रु
6	मज्जा	-----	अक्षि विट् स्नेह
7	शुक्र	ओज (शारंगधर)	ओज

4) **धात्वाग्नि**

- **स्वस्थानस्थस्य कायाग्नेः अंशा धातुषु संश्रिताः।**
  तेषां सादतिदीप्तिभ्यां धातुवृध्दिक्षयोद्भवः॥

5) **उपधातु**

- **रसात्, स्तन्यो ततो रक्तम् असृजः कण्डराः सिराः।**
  मांसात् वसा त्वचा षट् च मेदसः स्नायुसंभवः॥ **... च. चि.**

व्याख्या

- **सिरा स्नायु रजः स्तन्यत्वचो गतिविवर्जिताः।**
  धातुभ्यश्चोपजायन्ते तस्मात् ते उपधातवः।

6)

	धातु	उपधातु
1	प्रमुख घटक	तुलना में गौण घटक
2	धारण एवं पोषण कार्य	केवल 'धारण' कार्य
3	उत्तरोत्तर धातु पोषण - के लिए गति	गतिविवर्जित
4	कार्य विस्तृत स्वरुप के, आजन्म	कार्य विशिष्ट काल तक मर्यादित

5	धातुओं के कार्य में बिगाड → जीवन की गुणवत्ता में कमी अथवा जीवन ही खतरे में	उपधातुओं के कार्य बिगडने पर ज्यादा नुकसान नहीं होता
6	धातुओं की हानि अथवा वैगुण्य सत्वर तथा पूर्णांश से भर जाती है	उपधातुंओं की हानि शनैः-शनैः भर जाती है
7	धातु-अंतर्भाग में स्थित (अपवाद-शुक्रच्युती)	उपधातु - कार्य संपन्न करने के लिए शरीर के बाहर भी प्रकट हो सकते है।
8	धातु विकृति के लिए चिकित्सा तथा धातुबल बढाने के लिए धातु रसायन चिकित्सा उपलब्ध	उपधातुंओ की विकृती दूर करने के लिए मुख्यतः मूल धातु पर उपचार आवश्यक होते है।

7) **धातु निरुक्ति / श्रेष्ठ कर्म**

धृ, धारयति = धारण करना।

- **प्रीणनं जीवनं लेपः स्नेहो धारण पूरणे।**
  गर्भोत्पादश्च धातूनां श्रेष्ठ कर्म क्रमात् स्मृतम्। **... अ. हृ. सू.**

8) **स्त्रोतस – (13 महत्वपूर्ण स्त्रोतस)**

- **खानि स्त्रोतांसि।** **... सु. शा.**
- **स्त्रोतोमयम् पुरुषः।**

व्याख्या

- **मूलात् खादंतरं देहे प्रसृतं त्वभिवाहियत्।**
  स्त्रोतसः तद् इति विज्ञेयं सिरा धमनि वर्जितम्॥ **... सु. शा.**
- **स्व धातु समवर्णानि वृत्तस्थूलानि अणूनि च।**
- **स्त्रातांसि दीर्घाणी आकृत्या प्रतान सदृशानि च॥** **... च. वि.**

कार्य

- **स्त्रवणात् स्त्रोतांसि, स्त्रोतांसि खलु परिणाम आपद्यमानानां।**
  धातूनाम् अभिवाहिनि भवन्ति अयन अर्थेन। **... च. वि.**

4 प्रकार के कार्य – उत्पत्ती, परिणमन, वहन, उत्सर्जन।

स्त्रोतोमूल

- मूलम् इति प्रभवस्थानम्।

निर्मिति, परीक्षण, नियंत्रण स्थान

	स्त्रोतस	मूलस्थान		स्त्रोतस	मूलस्थान
1	प्राणवह	हृदय, महास्त्रोतस	8	अस्थि	मेद, जघन
2	अन्न	आमाशय, वामपार्श्व	9	मज्जा	अस्थि, संधि
3	उदक	तालु , क्लोम	10	शुक्र	वृषण, शेफ
4	रस	हृदय, दशधमनियाँ	11	मूत्र	बस्ति, वंक्षण
5	रक्त	यकृत, प्लीहा	12	पुरीष	पक्वाशय, स्थूलगुद
6	मांस	स्नायु, त्वक्	13	स्वेद	मेद, रोमकूप
7	मेद	वृक्क, वपावहन			

बहिर्मुख स्त्रोतस 9 → श्रोत्र - 2, नेत्र -2, कर्ण -2, मुख -1 गुद -1, मेढ्र -1

अन्य – स्त्रीयों में आर्तववह, स्तन्यवह, सुश्रुतोक्त - स्वरवह, मनोवह स्त्रोतस।

9) कला

- **धात्वाशयान्तर मर्यादा।**

कला निर्मिति

धात्वाशयांतर क्लेदो विपक्ताः स्वंस्वम् उष्मणा।

श्लेष्म स्नायु अपराच्छन्नः कलाख्यः काष्ठसारवत्। तः सप्त॥ ... अ. हृ. शा.

कला	कला क्र.	स्थान
रक्तधरा	2	सिरा, यकृत, प्लीहा
मांसधरा	1	मांस स्थित सिरा, स्नायु, धमनी स्त्रोतस
मेदोधरा	3	उदरस्थम्, अण्वस्थिषु
शुक्रधरा	7	सर्व शरीर व्यापिनी
पित्तधरा	6	आमाशय
श्लेष्मधरा	4	सर्व संधिषु
पुरीषधरा	5	पक्वाशय

- **या एव पुरीषधराकला सा एव अस्थिधराकला।**

  या एव पित्तधराकला सा एव मज्जधराकला॥

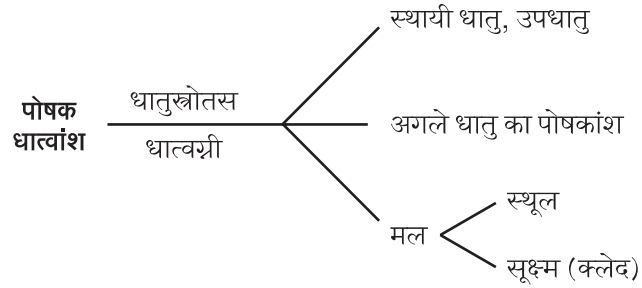
10) धातुपोषण काल

- **संतत्या भोज्यधातुनां परिवृत्तिस्तु चक्रवत्॥** ... चरक

धातुपोषण काल

	धातु	चरक के अनुसार	सुश्रुत के अनुसार
1	रस	1 दिन	1 दिन
2	रक्त	2 दिन	5 दिन
3	मांस	3 दिन	10 दिन
4	मेद	4 दिन	15 दिन
5	अस्थि	5 दिन	20 दिन
6	मज्जा	6 दिन	25 दिन
7	शुक्र	7 दिन	30 दिन

11) धातु परिणमन (त्रिधा परिणमन)



12) धातु मल

- **कफः पित्तम् मलः खेषु प्रस्वेदो नखरोम च।**

  स्नेहो अक्षित्वक्विशामोजो धातुनां क्रमशो मलः।

13) अंजली प्रमाण

उदक (10), रस (9), रक्त (8), पुरीष (7), श्लेष्मा (6), पित्त (5), मूत्र (4), वसा (3), मेद (2), मज्जा (1).

संक्षेपतः, अद्याक्षर लेकर उर रपु श्लेपि मूव मेम → 10 से 1 अंजली

इस प्रकार ध्यान में रखें।

14) धातु – पर्यायी नाम

1) रस – सौम्य धातु, परधातु, आत्रेय।

2) रक्त – शोणित, लोहित, असृक्, रुधिरम्, क्षतज, प्राणदं, जीवशोणितम्, आग्नेय, तेजोभव, रसोद्भव, मांसकारि, वसिष्ठ।

3) मांस – पिशितं, तरस, पलल, क्रव्य, काश्यप।

4) मेद – मांसज, मांसतेजः, अस्थिकृत, वपा, वसा, मस्तुलुङ्ग, मस्तिष्क, गोद, गौतम।

5) अस्थि – कीकस, कुल्य, मेदोज, मेदस्तेजः, मज्जकृत्, देहधारकम् सार, कर्कर, मांसपित्त, श्वदयितम्, भारद्वाज।

6) मज्जा – अस्थिस्नेह, अस्थिसंभव, शुक्रकर, विमज्जन, सार, कौशिक, विश्वामित्र।

7) शुक्र – शुच् + रक् = शुक्र, शुक्ल, अक्षय, निर्मल, मज्जसमुद्भव, आनन्दप्रभव,किट्टविवर्जित, पुंसत्व, ओज, वीर्यम्, रेतस्, धातुस्नेह, धातुसार, पौरुषम्, तेजः बीज।

15) धातु – गुण

1) रस – कफ के सभी गुण - स्निग्ध, शीत, गुरु, श्लक्ष्ण, श्वेत।

२) रक्त गुण

- **तपनीय इन्द्रगोपाभं पद्म आलक्तक संनिभम्।**
  गुंजाफलसवर्णं च विशुद्धम् विद्धि शोणितम्॥ ... च. सू.
- **विस्रता द्रवता रागः स्पंदनं लघुता तथा।**
  भूम्यादीनां गुणाः हि एते दृश्यन्ते अत्र शोणिते। ... सु. सू.
  स्निग्धं गुरू चलं स्वादु विदग्धं पित्तवद् भवेत्॥ ... शा. प्र.

विशुद्ध रक्तपुरुष

- **प्रसन्न वर्ण - इंद्रियम् इन्द्रियार्थ निच्छन्तम् अव्याहत पक्तृवेगम्।**
  सुखान्विते तु (पु)ष्टि बलोपपन्नम् विशुद्ध रक्तं पुरुषं वदन्ति॥ ... च. सू.

३) मांस

- **न अतिशीत गुरू स्निग्धं मांसम् अजल् दोषलम्।**
  शरीर धातु सामान्यात् अनभिष्यंदि बृंहणम्॥ ... च. सू.

4) मेद – स्निग्धता, गुरुत्व, मृदुत्व, स्थिरत्व, श्लक्ष्ण, पिच्छिल, सांद्र।

5) अस्थि – पार्थिव द्रव्य के गुण - कठीणता, खरता, घनत्व, गुरुत्व, स्थिरता।

6) मज्जा – स्निग्ध, शीत, गुरु यह कफ के गुण।

7) शुक्र – **स्फटिकाभं द्रवं स्निग्धं मधुरं मधुगंधि च।**
शुक्रम् इच्छन्ति केचित्तु तैलक्षौद्रं निभं तथा॥ ... सु. शा.

महत्त्वपूर्ण गुण – स्निग्ध, पिच्छिल, गुरु, मधुर।

16) धातु – कार्य

आहाररस

- **तर्पयति, वर्धयति, धारयति, यापयति**

1) रस
- **रसः तुष्टिः प्रीणनं रक्तपुष्टिं च करोति।** ... सु. सू.

तुष्टि, तर्पण, धारण, यापन, रक्त पोषण।

2) रक्त
- **जीवनं नाम प्राणधारणम्।**
- **तत् विशुद्धम् हि रुधिरं, बल वर्ण सुखायुषा।**
  युनक्ति प्राणिनं प्राणः शोणितम् हि अनुवर्तते॥
- **दशप्राणायतन → दश एव आयतनानि आहुः प्राणाः येषु प्रतिष्ठिताः।**
  शंखौ मर्मत्रयं कंठो रक्तं शुक्रः ओजसो गुदम्॥
  मांसपुष्टी, धातुनां पूरणम्, वर्णप्रसाद, अव्याहत पक्तृवेग, स्पर्शज्ञानम् असंशयम्, बल, आयुवृध्दी

3) मांस

- **मांसशरीरपुष्टीं मेदसः च।**

लेपन, आवरण, आकार, सौष्ठव, पुष्टता, शरीर - सुगठित, सुव्यवस्थित, सम मांसप्रमाण, सम - उपचित एवं आकर्षक।

- **मांसपेश्यो बलाय स्युः अवष्टंभाय देहिनाम्।**
- **प्रसारण आकुंचन योः अंगानां कंडरा मताः॥ ... शारंगधर**

4) मेद

- **मेदः स्नेह स्वेदौ दृढम् पुष्टिम् अस्थनां च॥**

उपचय उत्पन्न करना (कार्श्यत्व दूर करना)।

5) अस्थि

- **धारण, संरक्षण, अस्थिनी अवलंबनं कृत्वा न शीर्यन्ते पतन्ति वा।**
- **अस्थीनि देहधारणं मज्ज्ञः पुष्टिः च।**

केश, लोम, नख इन अस्थिमलों का पोषण करना।

6) मज्जा

- **मज्जा प्रीतिं स्नेहं बलं शुक्रपुष्टिं पुरणं अस्थनां च। ... सु. सू.**

7) शुक्र

- **गर्भोत्पादः श्रेष्ठं कर्म शुक्रस्य।**
  शुक्रं धैर्यं च्यवनं प्रीतिं देहबलम् हर्ष बीजार्थम् च॥ ... सु. सू.

17) धातु - प्रमाण

- **दोषधातुमलानां तु परिमाणं न विद्यते॥ ... सु. सू.**

रस – 9 अंजली, **रक्त** – 8 अंजली, **मेद** – 2 अंजली।

अस्थि (संख्या) – आत्रेय (360), सुश्रुत (300), आधुनिक (206)।

अस्थि प्रकार – नलक, कपाल, मण्डल, रुचक, तरुणास्थि।

मज्जा – 1 अंजली, (मस्तिष्क - 1/2 अंजली)।

शुक्र – 1/2 अंजली।

18) धातु सारता

धातु गुणवत्ता मापन, सार धातु = विशुद्धतर धातु, सर्वगुणसंपन्न धातु।

सार परीक्षण महत्त्व – बलमान विशेष ज्ञानर्थम्।

सारता प्रकार (9) – 7 धातुसारता, सत्व सारता, सर्वसारता

सारता निष्कर्ष – उत्तम, मध्यम, असार (हीन) सारता - श्लोक (संदर्भ च. वि. 8)

1) रस सारता

- **तत्र स्निग्ध श्लक्ष्ण, मृदु प्रसन्न, सूक्ष्म अल्प गम्भीर सुकुमार लोमा सप्रभेव च त्वक् साराणाम्। सा सारता सुख सौभाग्य ऐश्वर्य उपभोग बुद्धि विद्या आरोग्य प्रहर्षणानि आयुष्यत्वं च आचष्टे॥**

2) रक्त सारता

- **कर्ण अक्षि मुख जिव्हा नासा ओष्ठ पाणि पादतल नख ललाट मेहनं च स्निग्धरक्तम्। श्रीमद् भ्राजिष्णु रक्तसाराणाम्। सा सारता सुखं उद्धतां, मेधां मनस्वित्वं सौकुमार्यम् अनतिबलम् अक्लेसहिष्णुत्वं उष्णः असहिषणुत्वम् च आचष्टे॥**

3) मांस सारता

- **शंख ललाट, कृकाटिक, अक्षिगंड, हनु ग्रीवा, स्कंध उदरः कक्ष वक्षः, पाणिपाद संधयः, गुरु स्थिर मांस उपचिताः मांससाराणाम्। सा सारता क्षमा धृतिम् अलौल्यं वित्तं विद्यां सुखम्, आर्जवम् आरोग्यं बलम् आयुः च दीर्घम् आचष्टे॥**

4) मेद सारता

- **वर्ण स्वर नेत्र, केश, लोम, नख दंत ओष्ठ, मूत्र पुरीषेषु विशेषतः स्नेहो मेदः साराणाम्। सा सारता वित्त, ऐश्वर्य, सुख, उपभोग प्रदानानि आर्जवं सुकुमार उपचारताम् आचष्टे॥**

5) अस्थि सारता

- **पार्ष्णि गुल्फ जानु अरत्नि, जत्रु चिबुक शिरः, पर्वस्थूलाः स्थूलः अस्थि, नख दंताः च अस्थिसाराः। ते महोत्साहाः क्रियावन्त क्लेशसहाः सार स्थिर शरीराः भवन्ति आयुष्मन्तः च॥**

6) मज्जा सारता

- मृदु अंगाः बलवंतः, स्निग्ध वर्ण स्वराः, स्थूल दीर्घ वृत्त संधयः च मज्जासाराः ।। ते दीर्घायुषो बलवंतः श्रुत वित्त विज्ञान अपत्य संमानभाजः च भवन्ति ।।

7) शुक्र सारता

- सौम्याः सौम्यप्रशेक्षिणः च क्षीरपूर्णलोचना इव प्रहर्षबहुलाः स्निग्ध वृत्त सार सम संहतशिखर दशनाः प्रसन्न स्निग्ध वर्णस्वराः भ्राजिष्णवो महास्फिचः चं शुक्रसाराः । ते स्त्रीप्रियोपभोगाः बलवंतः सुखऐश्वर्य आरोग्य वित्त संमान अपत्यभाजः च भवन्ति ।।

8) सत्वसार

- स्मृतिमन्तो भक्तिमन्तः कृतज्ञाः प्राज्ञाः शुचयो महोत्साहा दक्षा धीराः समरविक्रान्तयोधिनः त्यक्तविषादाः । सुव्यवस्थित गति गंभीर बुद्धि चेष्टाः कल्याण अभिनिवेशिनः च सत्वसाराः ।

19) धातु वृद्धि / क्षय लक्षण (अ. ह. सू.)

1) रस वृद्धि • रसोऽतिवृद्धो हृदयोत्क्लेदं प्रसेकं च आपादायति ।

रस क्षय • रसे रौक्ष्यं श्रमः शोषो ग्लानि शब्दासहिष्णुता । रसक्षये हृत् पीडा कंप शून्यता तृष्णा च ।।

2) रक्त वृद्धि • रक्तं रक्तांग अक्षिता सिरापूर्णत्वं च ।

रक्त क्षय • रक्ते अम्ल शिशिर प्रीतिः सिरा शैथिल्य रुक्षता ।।

3) मांस वृद्धि • मांस गंड, ओष्ठ, उपस्थ, उरु, बाहु, जंघासु वृद्धिं गुरुगात्रता च ।

मांस क्षय • मांसे अक्षग्लानि गंडस्फिक् शुष्कता, संधिवेदना ।।

4) मेद वृद्धि • मेदः स्निग्ध अङ्गताम् उदर पार्श्ववृद्धिं कास श्वास आदीन् दौर्गन्ध्यं च ।

मेद क्षय • मेदक्षये प्लीहावृद्धी संधिशून्यता रौक्ष्यं मेदूरमांसप्रार्थना च ।।

5) अस्थि वृद्धि • अस्थि अधि-अस्थिनि अधिदंताः च ।

अस्थि क्षय • अस्थि क्षये अस्थिशूलं दन्तनखो भंगो रौक्ष्यं च ।।

6) मज्जा वृद्धि • मज्जा सर्वांग नेत्र गौरवम् ।

मज्जा क्षय • अस्थ्नां मज्जनि सौषिर्यं भ्रम तिमिर दर्शनम् ।।

7) शुक्र वृद्धि • अति स्त्री कामतां वृद्धं शुक्राश्मरीम् अपि ।

शुक्र क्षय • शुक्रे चिरात् प्रसिच्येत शुक्रं शोणितम् एव वा ।।

20) ओज - व्याख्या

- ओजस्तु तेजो धातुनां शुक्रान्तानां परं स्मृतम् ।। ... अ. ह. सू.

पर्याय - बल, प्राणायतन, सर्व धातुसार, जीवशोणित, श्लेष्मा, महत्, धारि ।

प्रकार - पर (8 बिंदु), अपर (1/2 अंजली) ।

ओज गुण • ओजः सोमात्मकं स्निग्धं शुक्लं शीतं स्थिरं सरम् । विविक्तं मृदु मृस्नं च प्राणायतनम् उत्तमम् ।।

ओज कार्य • ओजोविवृद्धौ देहस्य तुष्टि पुष्टि बलोदयाः ।

ओजो विकृती

1) ओजोव्यापत् - दुष्ट दोष दूष्य संसर्ग के कारण ।

- स्तब्धगुरुगात्रता वातशोफो वर्णभेदो ग्लानि तंद्रा निद्रा च व्यापन्ने ।।

2) ओजोविस्त्रंस - विक्षेपण में अवरोध ।

- संधी विश्लेषो गात्राणां सदनं दोषच्यवनं क्रियाश्च सन्निरोधश्च ।।

3) अपर ओज क्षय

- बिभेति दुर्बलो अभीक्ष्णं व्यथितेन्द्रियः दुश्छायो, दुर्मनः रुक्षः ।

4) पर ओजक्षय

- मूर्च्छा मांसक्षयो मोहः प्रलापो मरणम् ।

ओज बल के लाभ

- तत्र बलेन स्थिरोपचितमांसता, सर्वचेष्टासु अप्रतिघातः स्वरवर्णप्रसादः बाह्यनाम् आभ्यंतराणाम् आत्मकार्यप्रतिपतिर्भवति ।। ... सु. सू.

21) व्याधिक्षमत्वं

- नाम व्याध्युत्पादप्रतिबंधकत्वम् व्याधिबलविरोधित्वं ।। ... च. सू.
- अतृणे पतितो वन्हि - स्वयम् एव उपशाम्यति; देहधातुप्रत्यनीक भूतानि द्रव्याणि देहधातुभिः विरोधम् आपद्यन्ते । ... च. सू.
- शरीराणि च अतिस्थूलानि अतिकृशानि अनिविष्ट मांस शोणित अस्थीनि दुर्बलानि असात्म्य आहार उपचितानि अल्पआहाराणि अल्पसत्वानि च भवन्ति, अव्याधिसहानि विपरीतानि पुनः व्याधिसहानि ।। ... च. सू.
- बलवृद्धिकरास्तु इमे भावा भवन्ति । तत् यथा बलवत् पुरुषे देशे जन्म, बलवत्पुरुषे काले च सुखश्च कालयोगः, बीजक्षेत्र गुणसंपच्च, आहारसंपत् च शरीरसंपत् च सात्म्यसंपत् च सत्वसंपत् च, स्वभावसंसिद्धिः च यौवनं च कर्म च संहर्षः च इति ।। ... च. शा.

14. उपधातु

1) स्तन्य

- स्तनात् जातं स्तन्यम् ।।

पर्याय - पयः, दुग्धः, सोमज, गोरस, दुधस्त्र ।

प्रमाण - 2 अंजली ।

विशुद्ध स्तन्य - जल के साथ तत्काल घुल-मिल जाता है । (अप्सु परीक्षा)

गुण - स्निग्ध, शुक्ल, मधुर ।

कर्म - नवजात बालकों का देहधारण तथा वर्धन ।

- जीवनं - बृहणं सात्म्यं स्नेहनं मानुषं पयः ; मातुरेव पिबेत् स्तन्यं तत् परं देहवृद्धये ।। ... अ. हृ. सू.

2) रज

- मासि मासि रजः स्त्रीणां रसजं स्त्रवति त्र्यहम् ।
  तद्वर्षाद् द्वादशाद्ध्वं याति पञ्चशतः क्षयम् ।
- शशासृक्प्रत्तिंम यत्तु यद्वा लाक्षारसोपमम् ।
  तद् आर्तवं प्रशंसति यद् वासो न विरंजयेत् ।। ... सु. शा.

आर्तव

- स्त्रीणां शुक्रं न गर्भाय । भवेत् गर्भाय च आर्तवम् ।। ... सु. सू.
- ऋतौ भवति इति आर्तवम्, सूक्ष्म केश प्रतीकाशा बीजरक्तवहाः सिराः ।
  गर्भाशयं पुरयन्ति मासांद्बीजाय कल्पते ।।
  आर्तववहे द्वे तयोर्मूलं गर्भाशयः । आर्तववाहिन्यश्च धमन्यः ।

आर्तव वृद्धि

- आर्तवम् अङ्गमर्दं अतिप्रवृत्तिम् दौर्गन्ध्यं च ।।

आर्तव क्षय

- आर्तव क्षये यथोचितकाल अदर्शनम् अल्पता वा योनिवेदना च ।।

3) सिरा

सरणात् सिराः। चतुर्विध - अरुणा, नीला, गौरी, रोहिणी, 700 सिरा।

कार्य – रस के उपस्नेहन द्वारा, रक्त के द्वारा प्राण पहुँचाकर शरीर पर अनुग्रह करना।

... सु. शा. 7 /3, 23

4) कंडरा

- स्थूलस्नायु - चक्रपाणी।
- महास्नायु - डल्हण।

संख्या – 16.

कार्य – सन्धिबन्ध दृढ, भारवहन सामर्थ्य, हलचलों (गतिविधियों) में सहायता।

5) वसा

- **शुद्धमांसस्य यः स्नेहः सा वसा परिकीर्तिता।**

तुलना – मेद (स्वतंत्र धातु), वपा (उदर स्थित स्निग्धवर्तिका - चक्रदत्त), वसा (आयुर्वेदोक्त स्नेह - घृत, तैल, वसा, मज्जा), प्रमाण = 3 अंजली।

कार्य – मांस का स्नेह। अतः मांस को मृदुता, पुष्टता, दृढता।

6) त्वचा

पर्याय – चर्म, कृती, अजिन, वल्क, वल्कल।

कर्म – आवरण, संरक्षण, स्पर्शनेंद्रिय अधिष्ठान, वर्ण, उष्णता नियंत्रण, त्वक्सार अर्थात् रससार, धारण, रोपण, सन्धान, मांसधारण, पोषण, मलनिर्हरण।

चरकोक्त षट् त्वचा – उदकधरा, असृग्धरा, तृतीय - चतुर्थ - पंचम - षष्ठ।

सुश्रुतोक्त सप्त त्वचा – अवभसिनी, लोहिता, श्वेता, ताम्रा, वेदिनी, रोहिणी, मांसधरा।

जाडी – व्रीहिभाग - क्रमशः 18, 16, 12, 8, 5, 1, 2

7) स्नायु

(स्नायु = सूक्ष्म स्नायु, कण्डरा = महास्नायु)

पर्याय – वस्नसा, स्नसा।

कार्य – संधिबंधन तथा भारक्षमता।

संख्या – 900

प्रकार – प्रतानवत्, वृत्त (कण्डरा), पृथुल, सुषिर।

15. मल विचार

1) मूत्र

पर्याय

- **बस्तिमल, मेह, नृजलम् प्रस्त्राव, स्त्रव; प्रमाण → ४ अंजली,**
  जल + अग्नि → भूयिष्ठ, मूत्रवहे द्वे तयोर्मूलं बस्तिर्मेढ्रं च।
- **मूत्रस्य क्लेदवहनम् ।**

सुश्रुतोक्त मूत्रनिर्मिती

- **पक्वाशयगतास्तत्र नाड्यो मूत्रवहास्तु याः। तर्पयन्ति सदा मूत्रं सरितः सागरं यथा। सुक्ष्मत्वान्नोपलभ्यंते मुखान्यासां सहस्त्रशः। नाडीभिरुपनीतस्य मूत्रस्यामाशयान्तरात्। जाग्रतः स्वपतश्चैव स निःस्यन्देन पूर्यते। आमुखात् सलिले न्यस्तः पार्श्वेभ्यः पूर्यते नवः। घटो यथा तथा विद्धि बस्तिर्मूत्रेण पूर्यते॥**

मूत्रवृद्धि • **मूत्रं तु बस्तिनिस्तोदं कृते अपि अकृतसंज्ञतम्।**

मृत्रक्षय • **मूत्रे अल्पं मूत्रयेत् कृच्छ्रात विवर्णं अस्त्रमेवं च॥**

2) पुरीष

पर्याय • **शकृत्, उच्चार, उपवेशन, विट्, गूथ, शमल, वर्चस्,**

प्रमाण – 7 अंजली।

कार्य – अवष्टंभः पुरीषस्य।

(वायु तथा अग्नि का धारण → वायु गति नियंत्रण, अग्नि द्वारा पचन)

पुरीषवृद्धि • **कुक्षि आध्मानं आटोपं गौरवं वेदना शकृत्।**

पुरीष क्षय • **पुरीषे वायुरन्त्राणि सशब्दो वेष्ट्यान्निव।**

3) **स्वेद**

- स्विद्यते अनेन इति स्वेदः।

पर्याय
- घर्म, निदाघ,
- स्वेदवह स्त्रोतसां मेदोमूलं रोमकूपाश्च॥

कार्य
- स्वेदस्य क्लेदविधृति। स्वेद क्लेदस्तु त्वक्सौमार्यकृत्॥

स्वेदवृद्धि
- स्वेदोऽति स्वेद दौर्गंध्य कण्डुः॥

स्वेदक्षय
- स्वेद रोमच्युति स्तब्ध रोमता स्फुटनं त्वचः॥

16. मन, आत्मा, निद्रा, स्वप्न

1) **इंद्रिय पंचपंचक**

ज्ञानेंद्रिय, अधिष्ठान, इंद्रिय द्रव्य, विशेषगुण, इंद्रियबुद्धी।

(श्रोत्र - कर्ण - आकाश - शब्द - श्रावण)

2) **इंद्रिय**

प्रकार

5 ज्ञानेंद्रिय → श्रोत्र, त्वक्, चक्षु, रसना, घ्राण।

5 कर्मेंद्रिय → वाक्, पाणि, पाद, पायु, उपस्थ।

उभयेंद्रिय → मन।

3) **ज्ञानग्रहण प्रक्रिया**

- आत्मा मनसा संयुज्यते, मनः इंद्रियेण, इंद्रियम् अर्थेन् ततः ज्ञानम्॥

4) **योग**

व्याख्या

- युज् - युज्यते, योगस्तु चित्तवृत्ति निरोधः, समत्वं योग उच्यते, योगः कर्मसु कौशलम्। योगो मोक्षप्रवर्तकः ; योगे मोक्षे च सर्वेषां वेदनानाम् अवर्तनम्॥

हठ योग = ह + ठ = सूर्य (पिंगला) + चंद्र (इडा) = उष्ण - शीत सन्तुलन।

5) **अष्टांग योग**

1) यम
- तत्र अहिंसा सत्य अस्तेयं ब्रह्मचर्य अपरिग्रह यमाः।

2) नियम
- शौच, संतोष, तप स्वाध्याय, ईश्वर प्रणिधानानि नियमाः।

3) आसन
- स्थिर सुखम् आसनम्।

4) प्राणायम = प्राण + आयाम।

5) प्रत्याहार = प्रति + आ + ह्र।

6) धारणा • तत्र देशबंध चित्तस्य धारणा।

7) ध्यान • तत्र एकरुपता ध्यानम्।

8) समाधि • सत् चित् आनंद।

6) षट्चक्र

क्र.	चक्र	स्थान	शाखाएँ	मंत्राक्षर	महाभूत
1	मूलाधार	गुदसमीप	4	भं	पृथ्वी
2	स्वाधिष्ठान	लिंगोर्ध्व	6	वं	आप
3	मणिपूर	नाभी	10	रं	तेज
4	अनाहत	हृदय	12	यं	वायु
5	विशुद्ध	कंठ	16	हं	आकाश
6	आज्ञा	भ्रूमध्य	2	---	---
7	सहस्त्रार	मस्तिष्क	1000	---	---

7) स्वस्थ व्यक्ति में प्रसन्नता किस प्रकार महसूस की जाती है?

इंद्रिय – पटुत्वेन, **मनः** – आमोदेन, **आत्मा** – संतोषेन।

8) मन

पर्याय – चित्त, चेतस, मनु अवबोधने, हृदय, स्वान्त, सत्वम्, मन - कारण द्रव्य।

• **खादीन्यात्मा मनः कालो दिशश्च द्रव्यसंग्रहः॥** ... च. सू.

स्थान • शिरस्ताल्वन्तरगते सर्वेंद्रियं परं मनः॥

मनोवह स्त्रोतस • कृत्स्नमेव शरीरं स्त्रातेरुपं वक्ष्यति॥

मन – लक्षण • लक्षणं मनसो ज्ञानस्य अभावो भाव एव च॥

मन – गुण – अणुत्व, एकत्व, चंचलता, सत्व।

मन – कार्य • इंद्रियाभिग्रहः कर्म मनसः स्वस्य निग्रहः।
ऊहो विचारश्च ततः परं बुद्धिः प्रवर्तते॥

• मनः पुरःसराणि इंद्रियाणि अर्थग्रहण समर्थानि भवन्ति।

मन – विषय • चिन्त्यं विचार्यम् उहयं च ध्येयं संकल्प्यमेव च।
यत् किंचित मनसो ज्ञेयं तत् सर्व हि अर्थसंज्ञकम्॥ ... च. शा.

9) आत्मा

विभु, सर्वग, नित्य, निर्गुण, निर्विकार, केवल साक्षीमात्र।

कार्य • चेतनावान् यतश्चात्मा ततः कर्ता निरुच्यते। ... च. शा.

पर्याय – आत्मा, परमात्मा, भूतात्मा, जीवात्मा, अन्तरात्मा, चेतनाधातु, ईश्वर, क्षेत्रज्ञ, अत - सातत्यगमने धातु से आत्मा शब्द की उत्पत्ति, 9 कारणद्रव्यों में एक।

चरकोक्त आत्मा लक्षण (अर्थात् आत्मा के अस्तित्व के लक्षण)

• **प्राणापानौ निमेषाद्या जीवनं मनसो गतिः।**
इन्दियान्तर संचारः प्रेरणे धारण च यत्।
देशान्तरगतिः स्वप्ने पञ्चत्वग्रहणं तथा।
दृष्टस्य दक्षिणेन अक्ष्णा सव्येनावगमस्तथा।
इच्छा द्वेषः सुखं दुःखं प्रयत्न चेतना धृतिः।
बुद्धिः स्मृतरहंकारो लिंगानि परमात्मनः॥ ... च. शा. १

सुश्रुतोक्त षोडश कला पुरुष

तस्य (पुरुषस्य)

• **सुख दुःखे इच्छा द्वेषौ प्रयत्नः प्राणापानो उन्मेषनिमेषौ बुद्धिः मनः संकल्पः विचारणा स्मृतिः विज्ञानम् अध्यवसायः विषयोपलाब्धिश्च गुणाः॥** ... सु. शा.

10) निद्रा

निद्रा कारण

• **यदा तु मनसि क्लान्तेकर्मात्मान क्लमान्वितः।**
विषयेभ्यो निवर्तन्ते तदा स्वपिति मानवः। ... च. सू.

निद्रा लाभ

• **निद्रायत्तं सुखं दुःख पुष्टिः कार्श्य बलाबलम्।**
वृषता क्लीबता ज्ञानम् अज्ञानं जीवितं न च॥ ... अ. ह. सू.

निद्रा प्रकार

• **तमोभवा श्लेष्मसमुद्भवा च।**

- मनः शरीरश्रमसंभवा च ।।
  आगन्तुकी व्याध्यनुवर्तिनी च ।
  रात्रिस्वभावप्रभवा च निद्रा ।। ... च. सू.

स्वप्न के 7 प्रकार

- दृष्टं श्रुतम् अनुभूतं च प्रार्थितं कल्पितं तथा ।
  भाविकं दोषजं चैव स्वप्नं सप्तविधं विदुः ।। ... च. इ.

17. पूरक – अर्वाचीन विषयांश

1) Lymph

Modified Tissue fluid (water 94% and solids - 6% Solids → Protein, fat, sugar, urea, Ca, Cl), **Circulation** → Lymphatic capillaries → plexues ducts. Right lymphatic duct → Rt. internal jugular vein → Lt. subclavian. Lt Thoracic duct → Lt. Sub clavian → Sup vena cava.

Functions of Lymphatic System

1) Lymph glands - Filtering agent
   Defense mechanism against foreign bodies and bacteria
2) Phagocyte properties
3) Site of formation of lymphocytes
4) Forms → gamma globulins – Useful in immunological reactions
5) Arrests the spread of malignant cells.
6) Collects waste material from tissues.
7) Drainage of metabolites
8) Help in fat absorption and carriage
9) Maintains Body Fluids and blood volume

2) Blood

Plasma (55 %) and cells (45 %). **Plasma –** water 92 % and solids 8 % (Solids- Inorganic Na, K, Ca, Mg ; Organic – proteins; non protein nitrogenous sub – Urea, uric / acid and creatinine; fats; carbohydrates; enzymes)

3)

A) RBC formation

i) In embryo → From yolk sac

ii) From middle foetal - life upto 1 month after birth → liver and spleen

iii) Bone marrow - Main site of erythrogenesis. By 20th yr – All long bones, filled with inactive yellow marrow. Then only upper ends of femur, humerus, vertebrae, ribs, flat bones produce RBCs

B) W.B.C Formation

Granular leucocytes produces in red bone marrow (myeloid tissue) and Agranular leucocytes are produced in both myeloid and lymphoid tissue.

C) Hb formation

Hb is red pigment (chromo protein) of Blood. 2 parts – simple protein (globin) – 96 % and Iron containing pigment (haem) – 04% formation of Hb is inside RBC, in bone marrow.

Factors necessary for **synthesis of Hb**

i) First class proteins - Milk, lean meat, fish, eggs, nuts, legumes, beans and pulses

ii) Metals - Daily 12 mgm iron ; Cu, mg, Cobalt

iii) Thyroxine, Vit C, and B12.

4) Normal Count

i	RBC	4.5 – 5.5 millions / cmm
ii	WBC	4 to 11 thousands / cmm
iii	Platelets (Thrombocytes)	2.5 to 4.5 Laks / cmm
iv	Hb	12.5 to 14.5 gm %
	Neutrophils	60 – 70 %
	Eosinophils	1 – 4 %
	Basophil	0 – 1 %
	Lymphocytes	25 – 30 %
	Monocytes	2 – 4 %

5) Life span

i	RBC	120 days
ii	Platelets	3 days
iii	WBC	Granulocytes – 4 to 5 day
	(in tissue)	Monocytes – few months/yrs
		Lymphocytes – few months/yrs

(WBC – Life span can be as short as few hours in severe Infection)

6) Functions of Blood

i) Transport of O_2, CO_2, Nutrition.

ii) Drainage of waste products to lungs, kidney, intestine

iii) Vehicle for hormones, vitamins, other essential chemicals

iv) Maintenance of water balance and ion balance and acid base equilibrium

v) Regulation of body temp.

vi) Defence mechanism of body

vii) Due to coagulation property, guards against hemorrhagic ill effects.

7) Functions of RBC

i) Carry O_2 and CO_2

ii) Maintain viscosity, acid base balance and ion balance.

8) Functions of Hb

i) O_2 and CO_2 transport

ii) Maintain acid base balance

iii) After destruction Bile pigments are derived from it.

9) Functions of WBC

i) **Neutrophil** – active phagocytosis

ii) **Eosinophil** – are rich in Histamine. Anti allergic action.

iii) **Basophil** – Synthesize Heparin – prevents intra vascular clotting.

iv) **Lymphocytes –** T – Cellular immunity, B – produce antibodies (Gamma globulins). This is humoral immunity

v) **Monocyte –** In the tissues, they mature to form Macrophages – phagocytes against viruses, bacteria, fungi, tumour cells.

10) Physiological variations in RBc

i) **Diurnal variation –** Lowest in sleep and max in evening

ii) **Count -** increases after muscular exercise, at higher altitude, high external temperature, emotional stress, in new born babies, in athletes.

Increase in RBC count – Polycythaemia

Decrease in RBC count – Anaemia

11) Pathological causes of Polycythaemia

i) Lung diseases and congential heart diseases, which lead to hypoxia

ii) Loss of fluid (excess loose motions and vomiting) causes haemoconcentration.

iii) Polycythaemia vera disease – cause not known.

12) Physiological Decrease in RBC

During pregnancy

(Due to increase in plasma volume – haemo dilution)

13) Pathological decrease in RBC – Types of Anaemia

i) Nutritional

ii) Pernicious or megaloblastic (Deficiency of intrinsic factor)

iii) Hemorrhagic (wound, stomach ulcers, heavy menstruation)

iv) Hemolytic (Thalassemia- defect in synthesis of Hb, Erythroblastosis Foetalis)

v) Aplastic (Destruction or inhibition of Bone marrow)

vi) Sickle cell anaemia (manufacture abnormal kind of Hb)

14) Different types of Hb

i) Adult Hb or HbA and HbA2

ii) Fatal Hb or F Hb (2 Alpha and 2 Gamma chains)

iii) Abnormal Hb – Hbs, Hb E, HbC

15) Physiological – Leucocytosis

i) **Diurnal variation –** Lowest in morning and highest in evening

ii) **WBC increases –** After muscular exercise, after food intake, mental stress, great emotional excitement, severe pain, parturition, exposure to very low temperature, during

pregnancy, in new born 18-25 thousand/cmm, in Infant – 8 to 16 thousand/cm

Physiological Leucopenia – Rare

16) Pathological variations in WBC

i) **Neutrophilia –** Acute pyogenic infections – Abscess, Tonsillitis, Boils, Pneumonia

Neutropenia – Typhoid, Malaria, Aplastic Anaemia, Radiation, Drugs- Chloramphenicol.

ii) **Eosinophilia –** Allergic conditions (Br. Asthma and Hay fever, Tropical Eosinophilia), worm infestation, skin diseases, scarlet fever.

Eosinopenia – Patients on steroid therapy, stress, Acute pyogenic infection.

iii) **Basophilia –** Chromic myeloid Leukaemia.

iv) **Lymphocytosis –** Physiological – young Infants, During menstruation.

- **Pathological** → T.B, Whooping cough, Lymphatic Leukaemia, Auto Immune diseases, viral infection (rash), Infectious mononucleosis.
- **Lymphopenia** → Patient on steroid therapy.

v) **Monocytosis –** Malaria, Protozoal Infection, Kala azar, Collagen diseases, Infectious mononucleosis, Sub acute bacterial endocarditis.

17) Erythropoiesis

Haemocytoblast → Proerythroblast → Early erythroblast → Intermediate Erythroblast (rubricycte- begins to synthesize Hb) → Late erythroblast (Hb synthesis is max.) – Reticulocyte (contains 34% Hb) → Erythrocyte.

18) Leucopoiesis

A) Haemocytoblast → myeloblast → promyelocyte → Neutrophilic myelocyte → Neutrophilic metamyelocyte → Neutrophilic band cell → Neutrophils

B) Haemocytoblast → myeloblast → promyelocyte → Eosinophilic myelocyte → Eosinophilic metamyelocyte → Eosinophilic band cells → Eosinophils.

C) Haemocytoblast → myeloblast → Promyelocyte → Basophilic myelocyte → Basophilic meta myelocyte → Basophilic band cells → Basophils.

D) Haemocytoblast → Monoblast → promonocyte → monocytes → wandering Macrophages.

E) Haemocytoblast → Lymphoblast → pro-lymphocyte → large Lymphocyte → Lymphocyte → small T and small B (→ Plasma cells)

19) Platelets – formation

Haemocytoblast → mega karyo blast → promega karyocyte → Mega karyo cyte → meta mega karyo cyte → Thrombocytes

20) Muscles Types

i) Skeletal (Striated and voluntary)

ii) Cardiac (Striated but involuntary)

iii) Visceral smooth (Non striated involuntary)

21) Characteristics of muscles

Excitability, contractility, extensibility, elasticity.

22) Functions of muscle

i) Movements of bony joints – Locomotion, change in posture, muscular skills

ii) Production of body heat

iii) Maintenance of posture.

iv) Protect blood-vessels and assist in circulation

v) Formation of walls of Body cavities (support the organs)

vi) Help in respiration (maintenance of acid base balance)

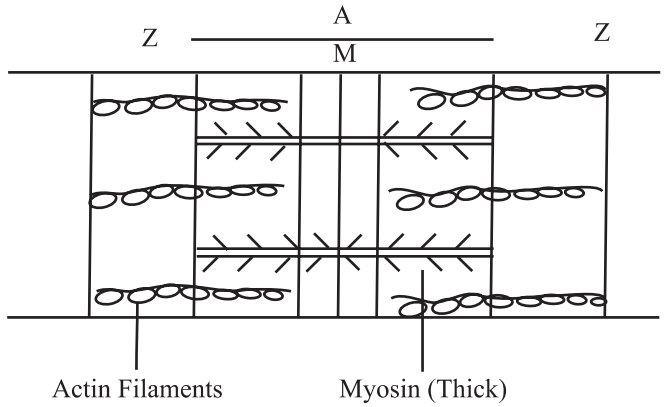
23) Muscle Contraction

Cerebrum (frontal Lobe-motor area) Nerve Impulse → at an axon terminal (Na^+ Infux → depolarisation) → synaptic vesicles release **Acetyl chlorine (Ach)** → Initiates muscle **Action potential** in muscle fiber sarcolemma (Transverse tubules) → Sarcoplasmic reticulum releases Ca^{2+} ions in sarcoplasm → Binding between **Troponin** and **Tropomyosin** becomes loose → Active sites over **G-actin** becomes uncovered and **Head of Myosin** comes in contact with active site of globular actin and the **Cross Bridge** is formed → Myosin AT Pase activated (ATP → ADP + Energy) – Energy activates Myosin cross bridges (i.e. It breaks Actin Myosin complex) → Pull head of myosin to next active site → This continues till last available site of actin → movements results in **sliding of thin myofilaments** → tension is developed – muscle contraction occurs **(Theory of sliding filament mechanism and By Hanson and Huxley)**

24) Muscle Relaxation

Ca++ pumped back into sarcoplasmic reticulum → **Myosin ATP-ase is depressed** → **Cross Bridges Broken** → **Myosin pulled back to its resting site** → **Tension Disappears**

25) Figure of muscle contraction



26) Functions of fat

i) Gives shape to Limbs and Body

ii) Keeps viscera in position and prevents injury

iii) Regulation of Body temperature

iv) Depot for stored energy

27) Functions of Bones

i) Protection of vital organs (Cranial and thoracic cavities)

ii) Skeletal support and shape to body → form Leverage system – movement and work possible.

iii) Basis → Attachment of muscles

iv) Lodges bone marrow → Haemopoietic function

v) Reservoir for minerals, (Phosphorus and Ca)

vi) Maintain-electrolytic balance. (Particularly distribution of Ca^{++} and PO^{4-})

vii) Detoxification → Lead, arsenic, radium – removed from circulation and deposited in bones

viii) Assist respiratory system (forming nasal cavity) and speech (bones of root of mouth)

ix) Ossicles of middle ear → Transmission of sound.

28) Spermatogenesis

Spermatogonia → Primary spermatocyte → Secondary spermatocyte → Spermatid → Spermatozoa

29) Semen

Spermatozoa from Testis and secretion from Epididymis, seminal vesicles, Cowper's glands, prostate.

30) Normal semen

i) **Quantity** → 2 to 6 ml, **Colour** → Almost whitish, Consistency → Viscid on ejaculation, **Liquefaction time** → 8 to 10 min, **Reaction** → Alkaline, **Fructose** – 0.04 – 4%, citric acid – 0.1- 1%

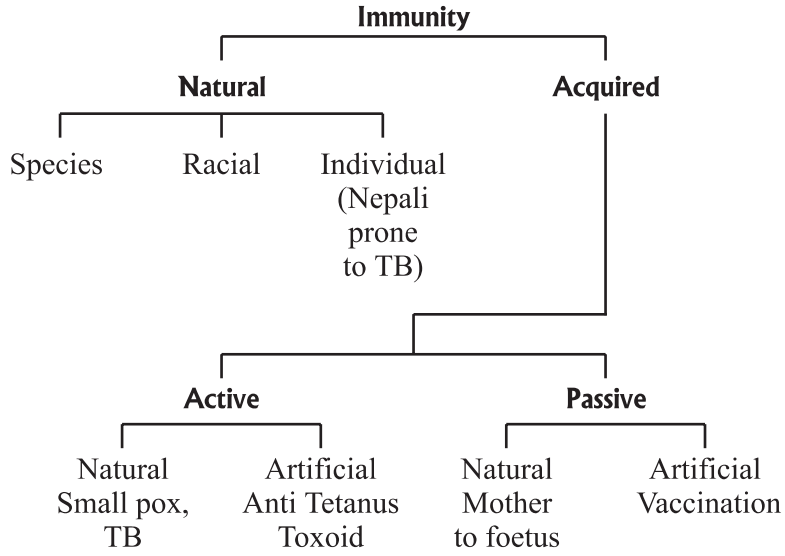
ii) **Microscopic**

Motility → Actively motile – 80-90%, Sluggishly motile = 5 – 10%, Non motile = 5-10%, **Abnormal forms –** Not more than 10%, **Leucocyte –** Usually none,

Total count - > 80 million/ml

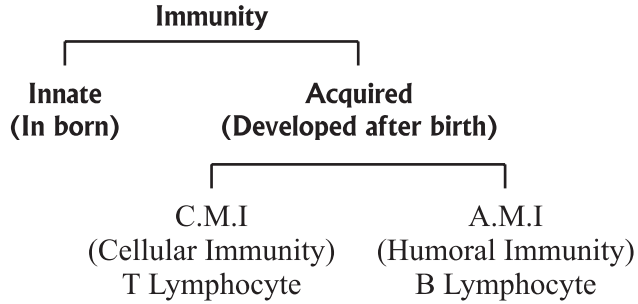
(Normal – 100-200 million/ml, < 20 million/ml = Oligozoospermia)

31) Immunity



32) Immunity

Resistance offered by Host against foreign particle



33) Hormone

Any chemical substance synthesized in body tissues and carried by blood to other parts of body for its specific action.

i) **Anterior Pituitary**

G.H., Prolactin, TSH, FSH, LH, ACTH, M.S.H.

ii) **Post Pituitary**

Oxytoxin, ADH (Vasopressin)

iii) **Thyroid**

Tri-iodo thyroxine (T_3) and Thyroxine (T_4), Calcitonin

iv) **Parathyroid** – Parathormone

v) **Adrenal cortex** – Cortisol, Aldosterone, Sex hormones.

vi) **Adrenal Medulla** – Adrenaline and non Adrenaline

vii) **Pancreases** – Insulin and Glucagon

viii) **Testis** – Testosterone

ix) **Ovary** – Oestrogen.

34) Action of Hormones

i) **Growth Hormone**

Stimulates general body growth, uptake of Amino acids and Protein synthesis; Stimulates Liver to produce – somatomedins, which cause proliferation of cartilage cells in epiphyseal plates of developing or growing long bones.

ii) **Prolactin**

Stimulate development of mammary glands, during pregnancy, following parturition – prolactin maintains milk production in mammary glands during lactation.

iii) **TSH**

Stimulates synthesis and secretion of T3 and T4, from Thyroid gland

iv) **FSH**

- **In females –** Promotes oestrogen secretion and growth and maturation of ovarian follicles.
- **In males –** Stimulates spermatogenesis and secretion of Androgen binding protein (ABP) by 'Sertoli cells'

iv) **LH**

- **In females –** In association with FSH – induces ovulation, promotes final maturation of ovarian follicles and formation of Corpus luteum, following ovulation. Also promotes secretion of Oestrogen and Progesterone from corpus Luteum.
- **In males –** Maintains and stimulates the Interstitial cells of Leydig to produce Testosterone (LH = I CSH = Interstitial cell Stimulating Hormone)

v) **ACTH**

Influences the functions of cells in Adrenal cortex. Stimulates the syntheis and release of Gluco-corticords from zona fasciculata and Zona Reticularis of Adrenal Cortex.

vi) **MSH**

Increase pigmentation of skin by causing dispersion of Melanin granules.

vii) **Oxytocin**

During Labour – it increases strong contractions of smooth muscles of uterus – resulting in child birth. Milk ejection reflex – release oxytocin, which stimulates contraction of myoepithelial cells of alveoli of breast milk ejection.

viii) ADH

To increase water permeability in distal convoluted and collecting tubules of kidney – more water reabsorption therefore concentration of urine increases

ix) T_3 and T_4

Accelerates metabolic rate and increase cell metabolism, Growth, differentiation and Development throughout body. Increase rate of Protein, Carbohydrates and Fat metabolism.

x) Calcitonin

Secreted by Para follicular cells – Reduce number of osteoclasts – more Ca is preserved in Bones) – Bl decreases Ca level

vi) Parathormone

Produced by **Chief cells –** Maintain proper Ca level, in blood. Increase the proliferation of Osteoclasts. Antagonistic to calcitonin. Parathormone influences kidney to form "Calcitriol" Hormone, which increase Ca absorption from G-I tract into blood.

xii) Aldosterone

Cells of zona Glomerulosa, produce this hormone increases Na (& water) resporption from distal tubules – Increase fluid volume – restores normal Electrolyte balance – Raises BP.

xiii) Gluco-Corticoids (Cortisol and cortisone)

Secreted by cells of zona fasciculata and zona reticularis – secretion of this hormone is Imp body response to stress – increases blood sugar, suppress inflammatory responses.

xiv) Sex Steroids

Produced by cells of zona reticularis – Amount produced are of little physiological significance.

xv) Epinephrine and Non epinephrine

These catecholamines are secreted by Adrenal medulla. These Hormones prepare individual for **Fight or 'Flight' response**, resulting in increase in heart rate, cardiac output, blood flow.

xvi) Testosterone

Needed in seminiferous tubules for – Normal spermatogenesis. Structure and function of all accessory reproductive glands and development and maintenance of Male secondary sex characteristics are dependant on Testosterone.

xvii) Estrogen

Development of – Female accessory sex organs, secondary sex characters, influence follicular phase (1^{st} half) of M. C., Ca+ deposition in bones is stimulated.

xviii) Thymus

Lymphocyte formation in children, related to growth of gonads, Imp in association with Immunology process in body.

35) Abnormalities in Hormonal secretion (Hyper or Hypo)

1) Thyroid

- Hyperthyroidism (Goitre / Thyrotoxicosis)
- Hypothyroidism – Cretinism (children) and Myxoedema (Adult)

2) Parathyroid

- Hyperparathyroidism (due to Tumour of glands) – Excess osteo-clastic activity
- Hypoparathyroidism (Tetany)

3) Adrenal cortex

- Primary Hyperaldosteronism (Conn's disease)
- Secondary hyper aldosteronism
- Over secretion of cortisol (Cushing Syndrome)
- Chronic Adrenal insufficiency (Addison's disease)

4) Adrenal medulla

- Tumor – over secretion of non Adrenaline (Phaeochromocytoma)

5) Pituitary (Anterior)

- Over secretion of GH – Gigantism (in young), Acromegaly (in Adults)
- Deficiency of GH (Dwarfism)
- ACTH (Hyperfunction) – Cushing disease (male), Cushing disease and virilism (female)
- ACTH –Hypo function – In young – Laurence Biddle moon syndrome, and Frohlich's syndrome (Infantile type); In Adults – Frohlich's syndrome (Adult type)
- Pan-Hypo Pituitarism – Simmond's disease.

6) Post-Pituitary

- Hypo-ADH secretion = Diabetes Insipidus

36) Local Hormones

Acetyl choline, Heparin, Histamine, Serotonin, Angiotensin, Bradykinin.

37) Urine formation - 3 steps

Glomerular filtration, Tubular reabsorption, Tubular secretion.

38) Fucntions of kidney

i) Excretes waste products
(especially Urea- End product of protein Metabolism)

ii) Maintain-Normal H^+ ion concentration, fluid and electrolytic balance

iii) Keeps water balance and plasma volume

iv) Eliminates drugs and toxic substances

v) Maintain Osmotic pressure in Blood

vi) Regulation of BP by **Renin-Angiotensin mechanism**

vii) Important role in Vit-D Metabolism

viii) Glomerular cell secrete Erythropoietin hormone, which stimulates Erythropoiesis.

39) Normal Constituents of urine

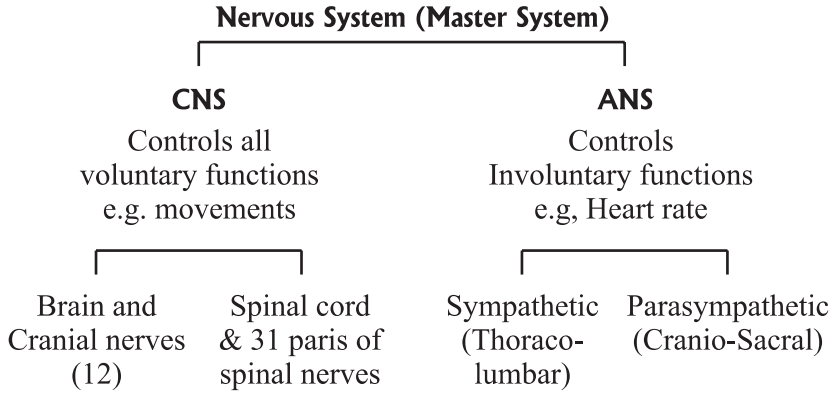
Organic – Urea (30 Gm), Creatinine, Uric acid, Hippuric acid, Indican, Acetone bodies !

Inorganic – NaCl (15 gm), KCl, PO_4, Ca^{2+}, NH^3, SO_4, MG^{2+}

40) Important controlling systems of body

Nervous system (short term) and Hormonal (long term control)

41)



42) 12 Cranial Nerves

(ये नाम मुखोद्गत करने के लिए – $O^3 T^2$ A F C G / V A H)

1) Olfactory) Optic 3) Oculomotor

4) Trochlear 5) Trigeminal 6) Abducent

7) Facial 8) Cochleo-vestibular 9) Glossopharyngeal

10) Vagus 11) Accessory 12) Hypoglossal

43) 31 pairs of spinal nerves

8 Cervical +12 Thoracic + 5 Lumbar + 5 Sacral + 1 Coccygeal

44) Parts of Brains

i) Fore brain – Cerebrum, Thalamus, Hypothalamus

ii) Mid brain

iii) Hind brain – Pons, medulla, cerebellum

(Brain stem= mid Brain + pons + medulla)

45) Lobes of cerebrum

Frontal, Parietal, Occipital, Temporal

46) Functions of Brain and nervous system

i) **Frontal lobe –** Motor, controls voluntary movements of opposite side (contralateral)

ii) **Parietal lobe –** Sensory, perceives sensation of opposite side

iii) **Occipital –** Visual centres - 17, 18, 19

iv) **Temporal** Auditory centres - 21, 22, 41, 42

Limbic system

v) **Prefrontal** Intellectual

vi) **Thalamus –** Relay station in sensory pathway

vii) **Hypothalamus –** controls – Pituitary – Temperature – food intake – water intake – ANS – Biological Rhythm – sexual behavior

viii) **Brain Stem –** Origin to cranial nerves

ix) **Reticular formation** (Network of Neurons and nerve fibres) – Sleep and wakefulness

x) **Medulla –** contains vital centre – Respiratory and Cardiac

xi) **Cerebellum -** **a) Neo –** co-ordination of movements

b) Paleo – muscle tone

c) Archi – Posture and equilibrium

xii) **Basal ganglia –** Corpus striatum (caudate nucleus and Putamen), Globus pallidus, substantia Nigra, Subthalamus – Regulation of muscle tone

xiii) **Spinal cord –** Reflex action, Ascending and descending tracts, origin to ANS fibre.

47) Functional Division of N. S.

i) Sensory System (Periphery to brain – 1^{st}, 2^{nd}, 3^{rd} order Neuron)

ii) Motor system (Brain to Periphery) – upper motor and lower motor Neuron.

48) Tracts Classification

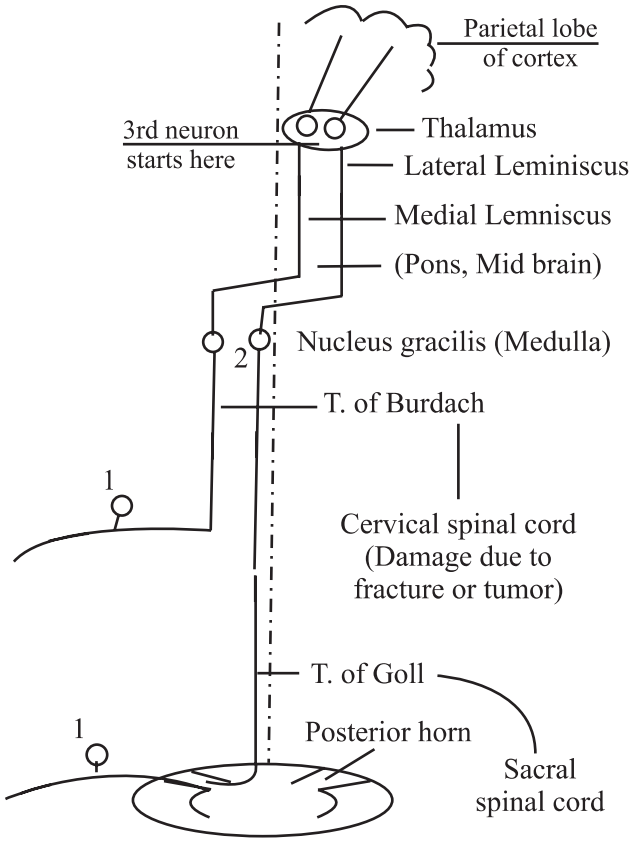
A) Ascending (sensory)

- Dorsal column tracts (T. of Goll and T. of Burdach)
- Spino-thalamic tracts (Lateral and ventral)

B) Descending (motor)

- Cortico spinal (Pyramidal)
- Extra Pyramidal (Sub cortical in origin)

49) Dorsal column tract **(स्पर्श – संवेदना वहन)**



50) Functions of Dorsal column Tract **(स्पर्श ग्रहण प्रक्रिया)**

i) Fine touch

ii) Tactile Localization

iii) Tactile Discrimination

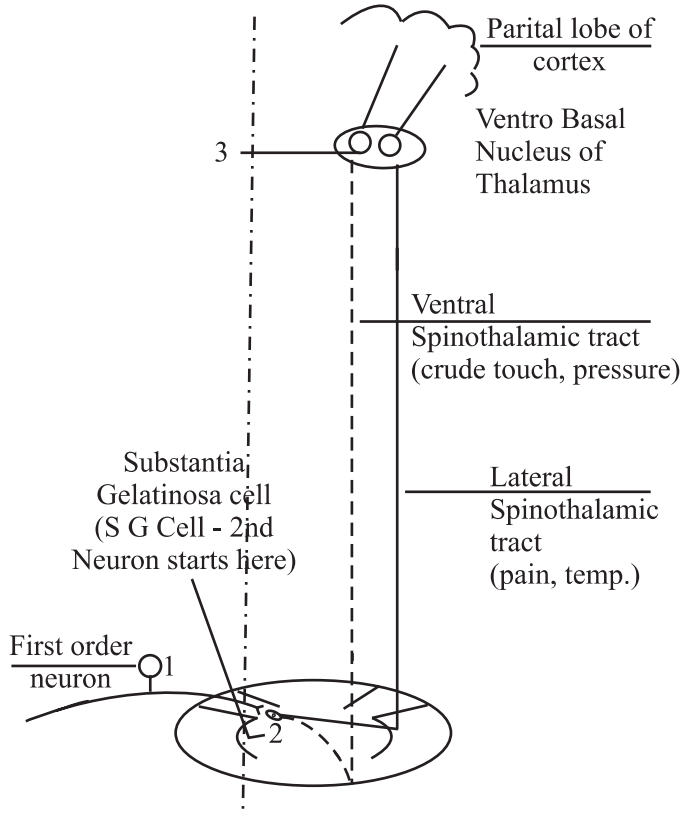
iv) Stereognosis

v) Vibration

vi) Joint position

vii) Muscle movement sense

51) Spino thalamic Tract **(स्पर्श – संवेदना वहन)**



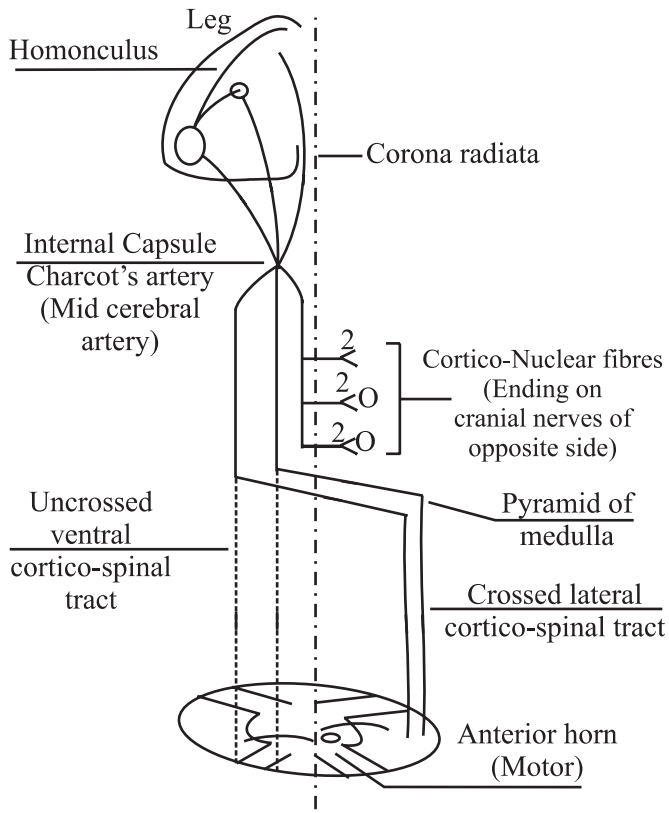
52) Functions of spino thalamic tract

All crude sensations are carried (स्पर्श ग्रहण प्रक्रिया)

i) Ventral tract – crude touch, pressure

ii) Lateral tract – Pain and temperature.

53) Cortico-spinal Tract (Descending Tract)



54) Functions of Corticospinal Tract (Motor Path way)

i) Voluntary movements are controlled

ii) Especially skilled movements of distal joint (writing, painting)

55) Extra-pyramidal tract

(Sub cortical motor area to → Spinal cord)

i) Reticulo – spinal tract

ii) Vestibulo – spinal Tract.

iii) Rubro (mid bran) – spinal tract.

iv) Olivo (medulla) – spinal Tract

v) Tecto (mid Brain) – spinal tract.

56) Functions of Extra Pyramidal tract

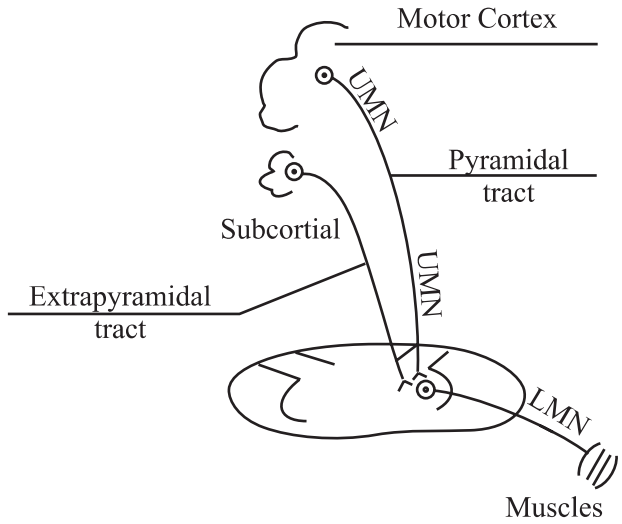
i) Controls gross postural movements of proximal joints

ii) Regulation of muscle tone

iii) They can control Voluntary movements if Pyramidal tracts are damaged

57) UMN and lMN

i) LMN – Last Neuron in Motor pathway which directly supplies muscle

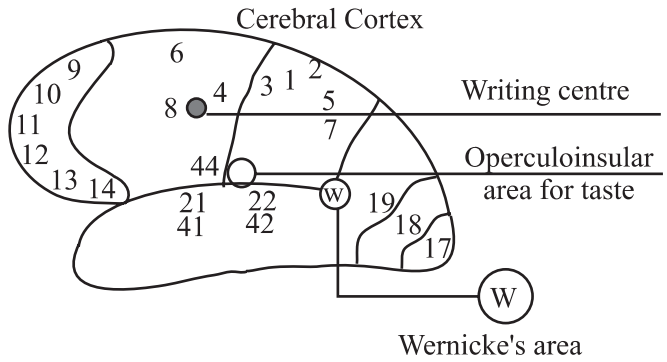


ii) UMN – First Neurons in motor pathway which end on anterior horn cells

UMN are having Inhibitory Influence on LMN

	UMN Lesion	LMN Lesion
1	Rigidity	Flaccidity
2	Hypertonia	Hypotonia
3	Sup. Reflexes are lost but Deep Ref. – exaggerated	All are lost
4	Involuntary movements may be seen	Absent
5	Motor Nerve degeneration not seen	Seen
6	No Atrophy	Atrophy (wasting present)
7	Babinski's sign + ve	Absent
8	e.g. Haemiplegia, Paraplegia	eg. Poliomyelitis

58) Centers in Cerebral cortex



i) **9 to 14** = Prefrontal lobe – Intellectual (planning, fore casting, goal directed activities)

ii) **6, 8** – Programming area

iii) **3, 1, 2** – Primary sensory areas

iv) **5, 7** – Sensory association areas – store sensory memory

v) **17** – Primary visual area ;
18,19 – Visual association area for visual memory.

vi) **41, 42** – Primary auditory area ;
21,22 – Auditory association areas

vii) **Wernicke's area –** General Interpretative area

viii) **44 – Broca's area** → for speech - supplementary Motor area

ix) Operculo insular area → for taste

59) Difference

	Organ	Sympathetic	Parasympathetic
1	**Eye**	Pupil-dilatation	Pupil - constriction
2	**Glands** Lacrimal, Nasal, Salivary	Secretion ↓	Secretion ↑
3	**Heart** B.P.	H.R ↑ B.P.↑	H.R. ↓ B.P.↓
4	**Lungs**	Bronchodilatation Secretions ↓	-----
5	**GIT**	Motility ↓ Glandular secretion ↓	↑
6	**U. Bladder**	Relaxation	Constriction of Bladder & relaxation of sphincter
7	**Genitalia**	Ejaculation	Erection
8	**Nervous System**	Stimulates A.R.A.S (Wakefulness & alertness)	-----
9	**Liver**	Glycogenolysis BSL ↑	-----
10	**Adipose tissue**	Lipolysis ↑ BFFA ↑	-----
11	**Function**	Body is kept ready to fight the stress	Body is kept under resting condition
12	**Examples**	Exercise and ↑mental tension	Sleep

60) Auditory Pathway (शब्द ग्रहण प्रक्रिया)

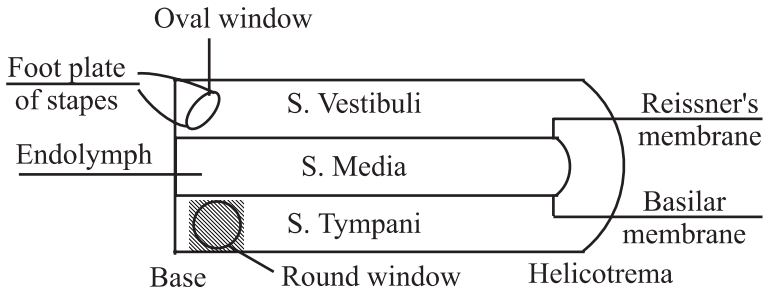


Fig. (a) - Cochlea.

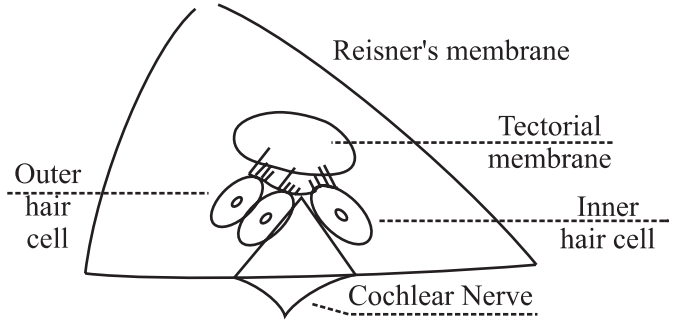


Fig. (b) - Organ of corti.

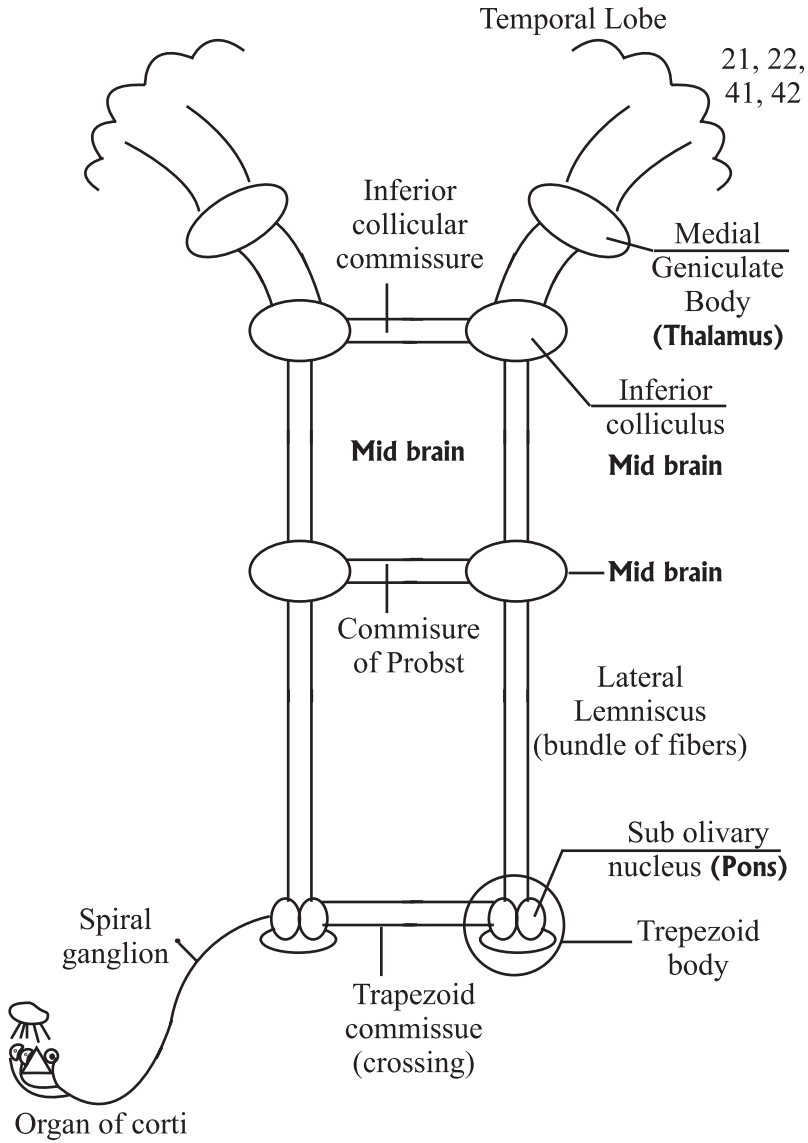
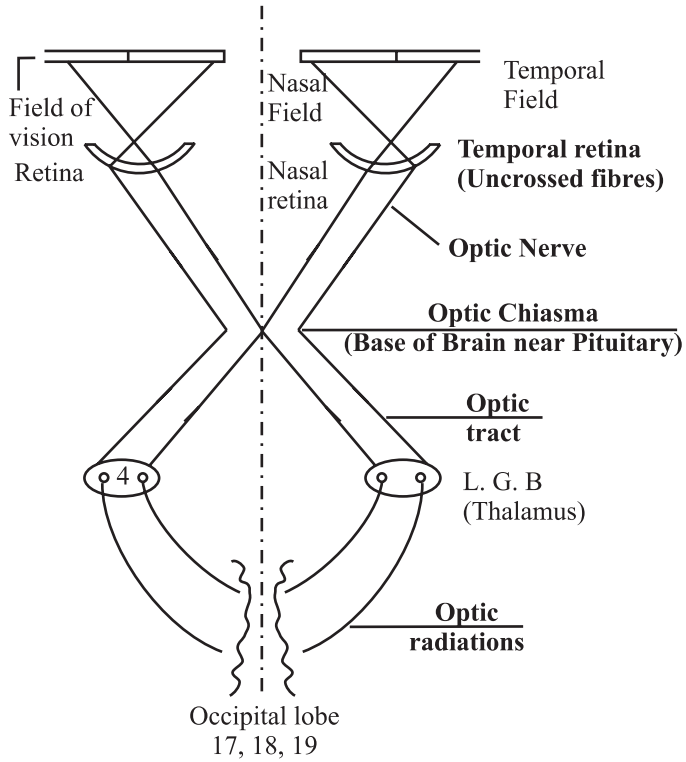


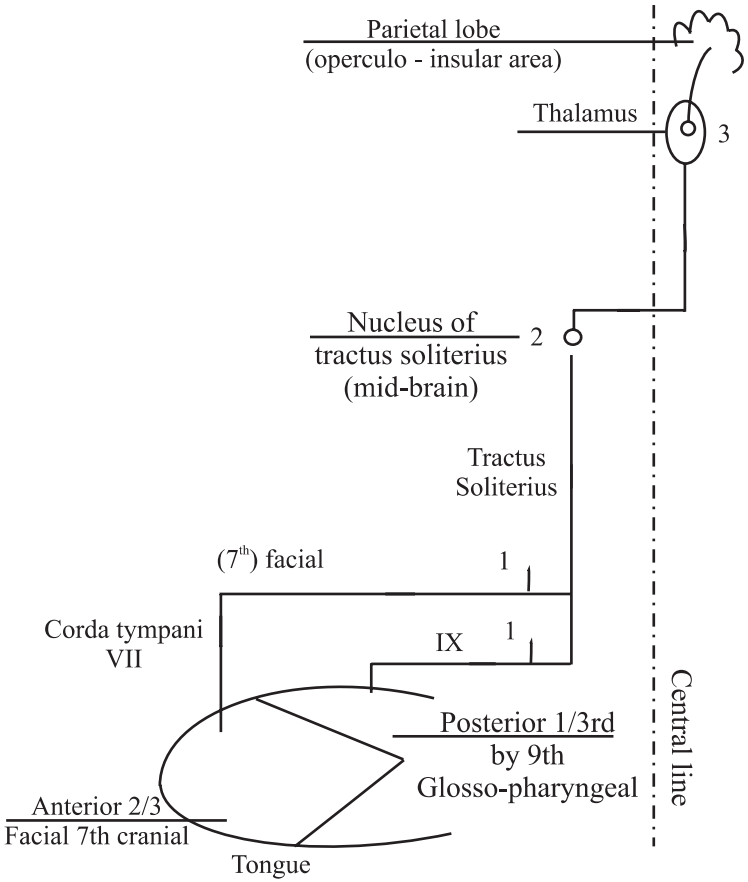
Fig. (c) - Auditory pathway.

61) Optic Pathway (रुप ग्रहण प्रक्रिया)



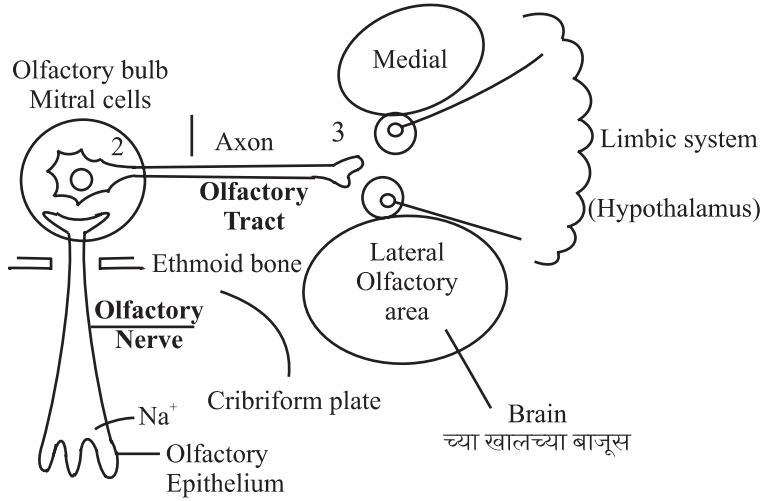
1) Optic nerve → From retina
2) Optic tract → From optic chiasma
3) Optic radiation → From LGB of thalamus
4) Optic lobe → 17, 18, 19

62) Gustatory path way (रस ग्रहण प्रक्रिया)



1) 2/3rd → 7th facial
2) 1/3rd → 9th glossopharyngeal
3) Tractus solitrius
4) Nucleus of tractus solitrius (mid brain) - cross
5) Thalamus
6) Operculo insular area of parietal lobe.

63) Olfactory path way (गंध ग्रहण प्रक्रिया)



1) From olfactory epithelium → olfactory nerve
2) Mitral cells in olfactory bulb
3) From there → olfactory tract
4) Medial and lateral olfactory area
5) Limbic system in hypothalamus

18. शारीरक्रिया प्रात्यक्षिक

1) Common Practicals in Exam

Hb, RBC, WBC, DC, BP, Urine, BT / CT.

2) Hb Practical

i) **Principle -** When Blood is mixed with N/10 HCl - Brown coloured pigment - acid Haematin is formed, which is matched with standard coloured tubes of Sahli's Haemoglobinometer.

ii) **Method -** N/10 HCI up to mark 2 in Hb tube-Take Blood -in Hb pipette up to 20 cmm mark - mix HCI & Blood - wait for 10 min. (Time required for formation of Acid Haematin) – After 10 min. dilute with water or HCI-till the appearance of shade of colour of comparator.

iii) This method - easy, not expensive, Instrument is portable

iv) **Other method of Hb measure -** Tallqvist method, Haldane's haemoglobinometer, Gowers Haemoglobinometer, Calorimetric method, spectrophotometric method.

3) RBC Practical

i) **Principle -** Number of RBC in Blood are too many and size of cell is very small. So difficult to count RBC, even with High power. So Blood is diluted with diluting fluid and then RBC are counted.

ii) **RBC diluting fluid (Hayem's) -** NaCl = 1 gm, crystalline Na_2SO_4 = 0.5 g, $HgCl_2$ = 0.5 gm, Dist. H_2O = 200 ml

NaCl & Na_2SO_4 $\rightarrow$ maintains viscosity, Na_2SO_4 $\rightarrow$ preserve the shape of RBC, $HgCl_2$ $\rightarrow$ prevent grown of organisms

iii) **Method -** High power - central 5 Big (80 small) square of RBC are observed : Blood in RBC pipette up to 0.5 mark + RBC diluting fluid up to 101 mark. Roll the pipette to mix two solutions. Wait 5 minutes. Discard first 3 drops from pipette and then charge Neubauer's chamber.

iv) **Calculations**

RBC = 10, 000 N.

Length of each small square = 1/20 mm

Breadth of each small square = 1/20 mm

Height bet. coverslip and chamber = 1/10 mm

Volume = L x B x H $= \frac{1}{20} \times \frac{1}{20} \times \frac{1}{10} = \frac{1}{4000}$ cmm

Volume of 80 squares $= \frac{1}{400} \times \frac{80}{1} = \frac{1}{50}$

$= \frac{1}{50}$ cmm contains $\rightarrow$ 'N' cells

$\therefore$ **1 cmm contains $\rightarrow$ 50 'N' cells**

But dilution is 200 times

$\therefore$ Final RBC count = 50 N $\times$ 200 = 10,000 N

4) WBC Practical

i) **Principal -** Same as RBC practical

ii) **WBC diluting fluid =** Glacial Acetic Acid = 0.2 ml ; Gentian Violet = 1 % solution in 1 ml; Dist. H_2O = to take vol. upto 100 ml.

Glacial Acetic acid $\rightarrow$ Lysis of RBC, Gentian violet $\rightarrow$ stains nucleus of WBC

iii) **Method -** Low power - Corner 4 big (64 small squares) of WBC are observed : Blood in WBC plipette up to 0.5 mark + WBC diluting fluid upto 11 mark. Roll the pipette. Wait 5 minutes. Discard first 3 drops from pipette and then charge chamber.

iv) **Calculations**

WBC = 50 N

Length of each small square = $^1/_4$ mm

Breadth of each small square = $^1/_4$ mm

Height between coverslip and chamber = $^1/_{10}$ mm

Volume = L $\times$B$\times$H = $\frac{1}{4}\times\frac{1}{4}\times\frac{1}{10}=\frac{1}{160}$cmm

Volume of 64 squares = $\frac{1}{160}\times\frac{64}{1}=\frac{2}{5}$cmm

$\frac{2}{5}$cmm contains $\rightarrow$ 'N' cells

$\therefore$ 1 cmm contains $\rightarrow$ $\frac{5}{2}$ N cells

But dilution is 20 times

$\therefore$ Final WBC count = $\frac{5}{2}\times N\times\frac{20}{1}$ = 50 N

5) Good P. B. S. (Peripheral Blood smear)

Not very thin or thick, evenly spread, Tongue shaped.

Parts -Tail, Base, Body.

Uses - Study of morphology of RBC, WBC, D.C., M.P., Gross platelet Count,

Preparation Method - Leishman stain on smear - wait 2 minutes. spread equal amount of Tap water - wait for 10 minutes - wash - dry.

Leishman stain = Mix of Methylene Blue and Eosin in Alcohol, for DC - oil immersion lenses (100 X) and cedar wood oil.

6) WBC cells

i) **Neutrophil -** (10-12 μ) Multi lobed Nucleus = fine granulated cytoplasm

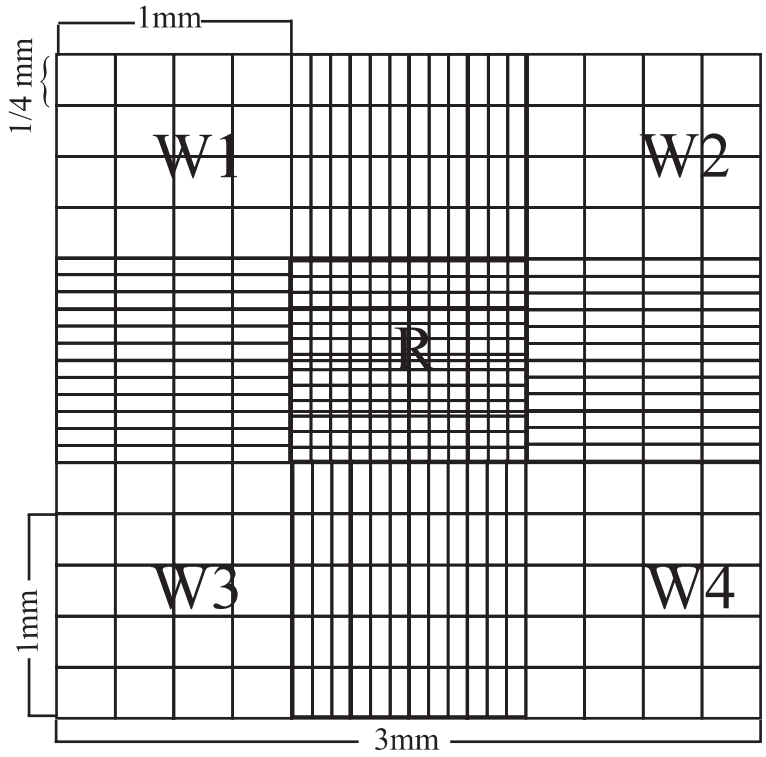
ii) **Eosinophil -** (10 μ) Bilobed = pink shiny big granules

iii) **Basophil -** (8-10 μ) Bilobed Nucleus, Granules overlap Nucleus

iv) **Lymphocyte -** (Small - 7 μ, large -10-14 μ) Non granulated large nucleus

v) **Monocylte -** (10 - 18 μ) Largest cell = large horse shoe shaped Nucleus

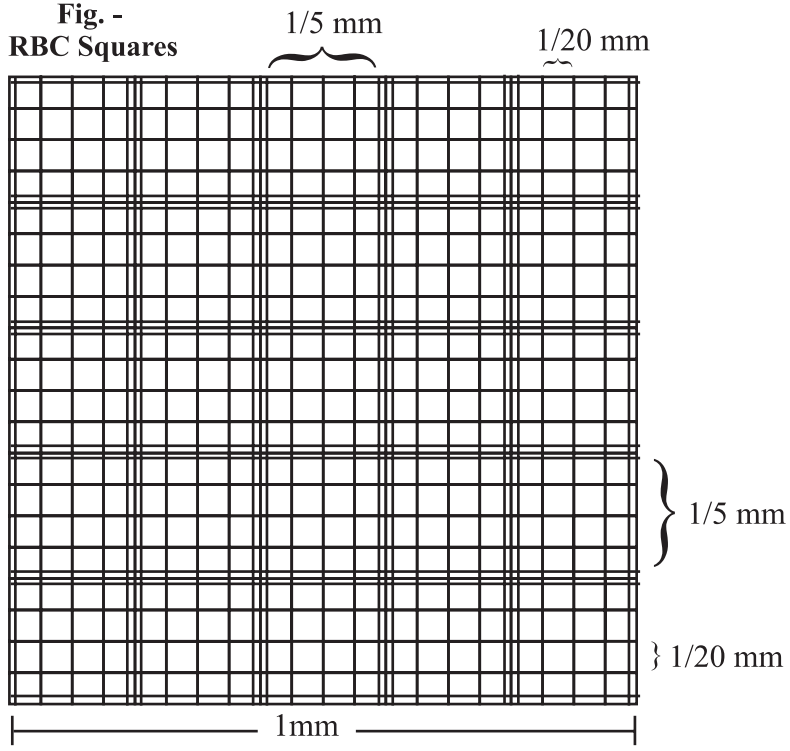
7) Neubauer's chamber



= W1,W2,W3,W4 - corner squares - each having 16 small squares

= R - Central square - 25 smaller squares each further divided into 16 smallest squares - Total 400 smallest squares

Fig. - RBC Squares



8) Bleeding time

B. T. = 2 - 3 min.

In Thrombocytopenic Purpura → B.T ↑

Functions of platelets

Initiate Blood clotting, Repair capillary endothelium, speed up clot retraction, Helps in Haemostatic mechanism.

9) Clotting Time

C. T. = 4 - 9 min.

i) Steps of Haemostasis → Vascular spasm, Platelet plug formation, coagulation,

ii) Coagulation factors - Total = 13.

1) Fibrinogen, 2) Prothrombin,

3) Thromboplastin, 4) Ca++

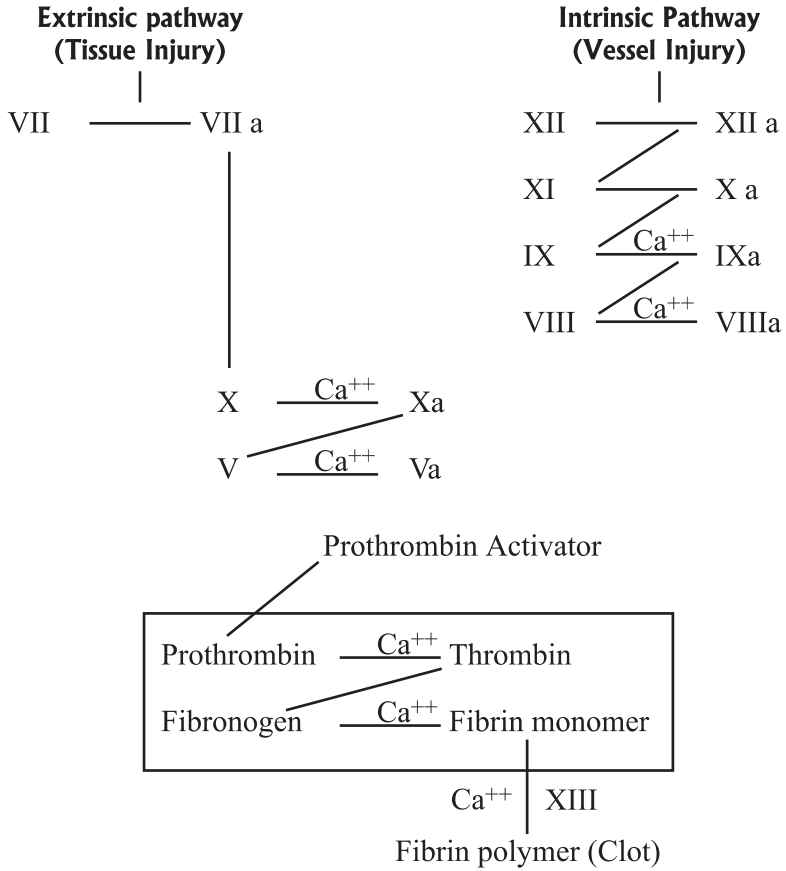
5) Proaccelerin, 6) 6th factor - Not named,

7) Proconvertin, 8) Anti haemophilic factor A,

9) Christmas factor 11) Anti haemophilic factor C

12) Hageman factor, 13) Fibrin stabilizing factor.

10) Clotting Process



Intrinsic pathway का क्रम याद रखने के लिए निम्न संख्या मुखोद्गत करें - 12 - 11 - 9 - 8 - 10 - 5.

11) C. T. Methods

i) Lee and white

ii) Capillary tube method of Wright

In haemophilia - C. T. ↑

12) B.T. ↑ - Thrombocytopenic purpura

i) E.S.R.- At the end of 1 hr.

	Wintrobe	Westergren
Male	0-9 mm	3-5 mm
Female	0-20 mm	7-15 mm

E. S. R. is not diagnostic but it is prognostic Test (e.g. for T. B., R. A.)

ii) Physiological variations - In old age, pregnancy ↑. Lowest in New born.

iii) ESR depends upon - Sp.Gr.of RBC (1090), sp.gravity of plasma(1030), Viscosity of Blood, Temp. , Rouleaux formation.

iv) Rouleaux - RBCs are negatively charged. But due to plasma proteins and Cholesterol, they stick to each other and get piled over one another. This is Rouleaux formation.

13)

i) P. C. V.

In male - 42% - 52% and In female - 37% - 47%.

ii) P.C.V. ↑ in Polycythemia and P.C.V. ↓ in Anaemia

14) Blood Groups

Imp. → before blood transfusion, cross matching of Donor and recipients blood is must, for identifying paternity, identity in criminal cases, imp. in pregnant woman to avoid **Erythroblastosis foetalis**.

15) Urine

5 physical + 5 chemical Tests

पांचभौतिक + तैलबिंदू परीक्षण।

A) Physical

i)	Colour	–	Pale yellow
ii)	Apperance	–	Clear, transparent
iii)	Reaction	–	Acidic
iv)	Odor	–	Urinous
v)	Sp. gravity	–	1.012 – 1.025

B) Chemical

i) Albumin (protein) – 2/3 urine – heat upper 1/3rd – ppt – Alb or phosphate – Add 10% Acetic acid – ppt persist – Albumin present

ii) Sugar – 5 ml of Benedict's solution + 8 drops of urine – Heat – Color change as green – yellow – orange – red (0.5, 1, 1.5, 2% sugar) when sugar present.

iii) Bile Salt – 5 ml urine – sprinkle sulphur powder – If sinks, Bile salts present (Due to presence of bile salts, surface tension of urine – reduced and powder sinks);

iv) Bile pigments – Principle – Barium chloride is converted to Barium Sulphate.

Due to sulphate radicals present in urine, Bilirubin adheres to Barium sulphate. Due to ferric chloride and Trichloroacetic acid (contents of Fouchet's Reagent), oxidation of Bilirubin to biliverdin takes place so Bilirubin can be detected.

Method

4 ml urine + 2 ml. Barium chloride (urine and $BaCl_2$ → 2 : 1) – Filter the solution – After drying filter paper – add 2-3 drops Fouchet's reagent on precipitate of filter paper – green color – Bilirubin present. Now, add 3 - 4 drops (Ehrlich reagent in filtrate of test tube – wait 5 min – Light pink color indicates normal quantity of urobilinogen, But Darker red color – Abnormal urobilinogen (Urobilinogen is breakdown product of Bilirubin) !

v) Ketone Bodies – 2 pinch of Rothera's powder in petry dish + add 2-3 ml of urine – If purple color, ketone bodies present. (ketone bodies – Acetone, Aceto acetic acid , Beta hydroxy butyric acid)

तैलबिंदू परीक्षण (योगरत्नाकर)

अष्टविध परीक्षा

काचपात्रात 30-40 मि. लि. मूत्र घेऊन, ड्रॉपरने तिळतेलाचा 1 थेंब टाकावा - स्थिर किंवा सहजगत्या पसरला - आरोग्य, किंवा व्याधी सुखसाध्य, तेलाचा थेंब बुडाला किंवा वायव्य, ईशान्य दिशेला पसरला -व्याधी कष्टसाध्य किंवा असाध्य.

काचपात्र में 30 – 40 ml. मूत्र लेकर, ड्रॉपर से तिल-तेल की एक बूँद डालें -

- स्थिर अथवा सहजता से फैलने पर - आरोग्य अथवा व्याधी सुखसाध्य,
- तेल की बूँद डूब जाए अथवा वायव्य, ईशान्य दिशा में फैलने पर - व्याधी कष्टसाध्य अथवा असाध्य.

16) Inferences of Urine Exam

i) Normal Quantity of Urine – 1500 ml/day

a) More quantity – more consumption of water or liquids – tea, coffee, juices, cold weather ; Pathology – Diabetes mellitus and Diabetes insipidus.

b) Less quantity – Dehydration, hot atmosphere, pathology – Hypovolemic shock.

ii) Colour

a) Dark yellow or high colour urine – Fever, dehydration, Consumption of Tab. like B-complex or furazolidne; Jaundice.

b) Red – Urinary calculus, Trauma, Consumption of Tab-Rifampicin.

iii) Sp. Gravity – High in D.M and Low in Diabetes insipidus.

iv) Albuminuria – Fever, Glomerulo Nephritis, Anaemia, cardiac disorder (Trace albumin – in pregnancy but if Albumin +++, in pregnancy – Indication of Toxaemia of Pregnancy)

v) Glycosuria – Diabetes mellitus, Low Renal threshold

vi) Bile salts and Bile pigments – Infective Hepatitis.

viii) Ketonuria – Diabetic keto acidosis, starvation, Fasting, sever dehydration, (Ketone bodies are intermediate product of fat metabolism. In severe D.M. – fats are broken in large quantities to generate energy , but not get utilised completely. So ketone bodies accumulate in blood and excreted in urine.)

17) Contents of Reagents, in Urine Exam

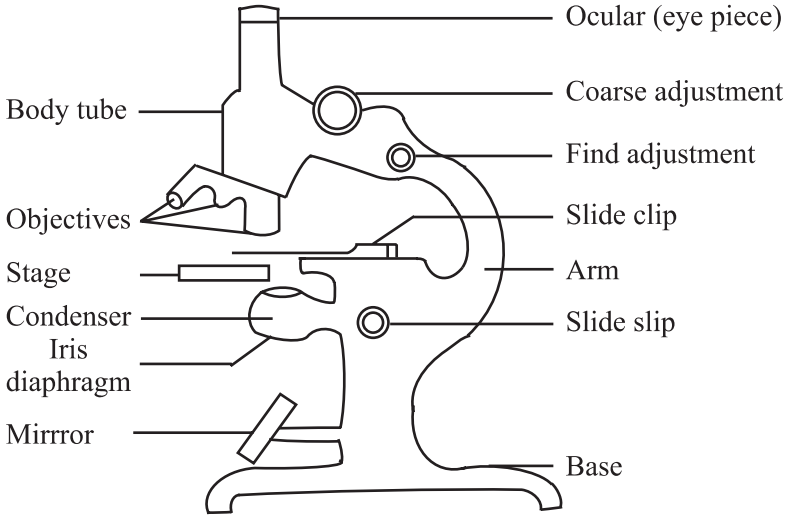
A) Benedict's Qualitative Reagent - Crystalline copper sulphate + Sodium carbonate

B) Fouchet's Reagent - Trichloroacetic acid – 25 g + 10% Ferric chloride – 10 ml + D. W (to make 100 ml solution)

C) Ehrlich's Reagent - Para dimethyl amino benzaldehyde 29 gm + 5% pure analytical HCl to make 100 ml solution.

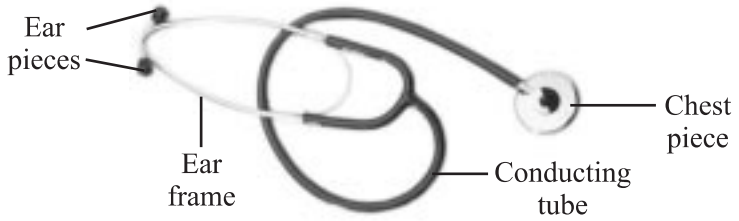
19. Instruments

1) Microscope



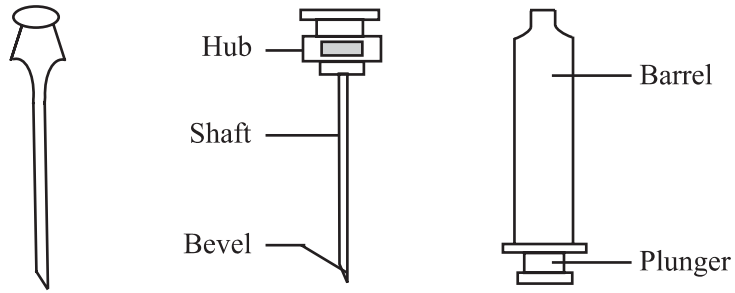
Monocular, Binocular (Light, Electron). **Principle –** Light rays, coming from on object are gathered by objective lenses. Then real, inverted, magnified images is formed by eyepiece. **Parts –** 3 systems → Support, Light, Magnification. Base, Arm, Stage, Body tube, Condenser, Diaphragm, Objective lenses – Low power, High power, Oil immersion (10 X, 45x, 100X) ; Eye pieces – 5X, 6X, 10 X, 12 X, 15 X. **Adjustment** → low power – keep condenser low; High power – condenser middle and for oil immersion – condenser high up ; **Plain mirror –** Low power lenses, In Natural Light and **concave mirror –** for high power lens and in Artificial Light.

2) Stethoscope



Stetho = chest and **scope** = To inspect. Discovered by Lennace in 1816. **Uses –** To hear – Heart sounds, Respiratory sounds, Peristaltic movements, Foetal heart sounds, to measure B.P.; **Parts –** Chest piece, Diaphragm for low pitch sound and Bell for high pitch sound, Conducting tube, Ear frame, Ear piece.

3) Syringes / Needles



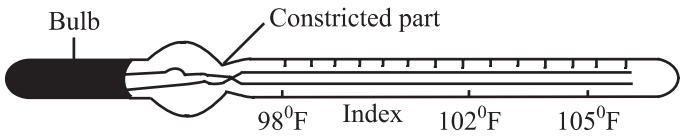
Disposable needle **Non disposable needle** **Syringe**

Syringe – Barrel, plunger; **Needle –** Bevel, shaft, hub, **Uses –** To give I.M. or I. V. Injections OR to take out the Blood, Number of Needles and uses – No. 18, 19 – To take out blood or to give thick injections like Inj Penidure LA 12, 24 for syphilis, No. 21 Oily Inj. No 22, 23 – Watery Inj, No-24 – For children ; Syringes – 2 CC, 5CC, 10 CC, 20 CC, 50 cc.

Types

Disposable syringes and needles, scalp vein set (IV set), Insulin syringe and needle, Glycerine syringe (for giving Glycerine or अनुवासन बस्ती), Lumber puncture Needle **Site for giving injection** → Triceps muscle, Gluteus muscle, Ant. abdominal wall – Subcutaneous (Rabies), Lt. arm – Origin of Deltoid muscle (BCG);

4) Thermometer



Normal Body Temp. → 97^0 – 98.5^0 F or 36^0 C to 37.5^0 C;

C = F – 32 x 5 / 9

Sites – Axilla, Mouth, Rectum, vagina;

Parts – Bulb, constricted part, Index

Curved surface → acts as lens and magnifies level of mercury,

Flat surface → Graduated Index

Principle

Mercury expands, when it comes in contact with body heat and so temperature can be recorded.

Temperature depends upon – Time of the day (Evening > Early morning),

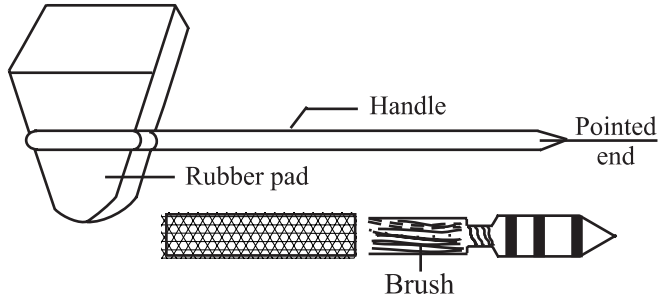
Sex (In female, temperature ↑ on the day of ovulation, during M.C) **Organ** – In liver, max. heat is produced; **clothes –** Temperature of organs covered with clothes, is more, **Exercise –** After exercise temperature ↑

Body temperature types → Core Temperature (Inside) > Shell temperature (external skin).

Temperature regulating center → Hypothalamus

Center stimulated By – Thyroxin and sympathetic N.S.

5) Clinical hammer



Parts - Rubber pad, handle, brush;

Principle

By applying external stimulus to joints, bones, tendons, skin – response in the form of Reflex can be observed and Neuromuscular co-ordination and reflex arc can be examined;

Reflex Arc = Receptor (skin) → Afferent Neuron → Association Neuron → Efferent Neuron → Effectors (muscle);

Reflex – Definition – Involuntary motor response, due to a sensory stimulus.

Reflex types – Superficial, Deep, Visceral

A) Superficial – Plantar, corneal, pupillary, cremasteric, abdominal

B) Deep – Bicep, Triceps, wrist, knee, Ankle

C) Visceral – Sneezing, Coughing, Defecation, Micturition.

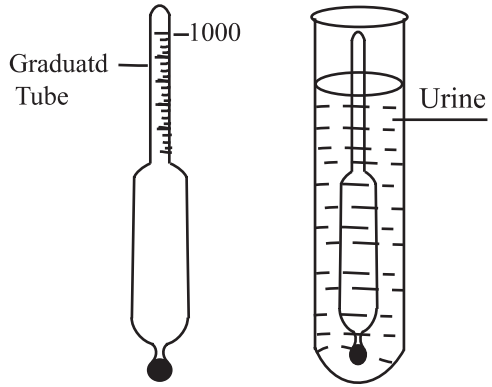
	Deep Reflex	Method	Response	Centre
i	Bicep	Tapping Bicep tendon	Flexion of forearm	C5 and 6
ii	Triceps	Tapping triceps tendon	Extension forearm	C7 and 8
iii	Wrist jerk	Stroking supinator tendon	Jerking up and Supination of hand	C5 and 6
iv	Knee	Tapping patellar tendon	Jerking forward of leg	L3 and 4
v	Ankle	Tapping tendo achillis	Planter flexion of foot	S1 and 2

	Superficial Reflex	Method	Response	Centre
i	Plantar (Babinskin's sign)	Stretching the lateral border of sole	Dorsiflexion of toes. In infants & Pyramidal lesion extension and fanning of toes	S1
ii	Pupillary	Fall of light on eye	Contraction of pupil	3rd nerve (occulo-motor) nucleus
iii	Conjunctional	Touching conjunctiva	Winking	Nuclei of 5th & 7th (Trigeminal & facial Cranial nerve

UMN – Reflexes Exaggerated

LMN – Reflexes Diminished

6) Urinometer



Used for Testing Sp. Gr. of urine (1.012-1.025).

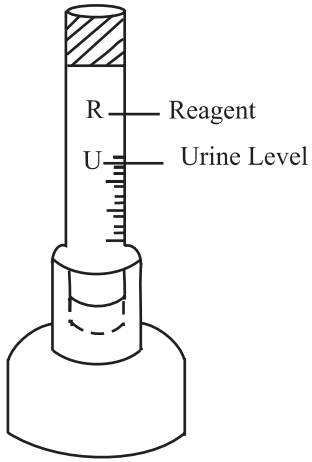
Sp. Gr – Definition

Density of a substance, which is compared with Density of water (which is 1.0)

Principle - Sp. Gr of urine depends upon → solutes present in urine. Increased up thrust of solution means more Sp. Gr. !

Parts - Steam (graduated – 1.000 at top and 1.060 at bottom), Base (rounded and heavy).

7) Esbach Albuminometer

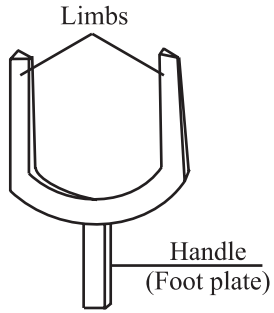


To measure amount of Proteins in urine.

Parts – Vertical glass tube with U and R markings (up to mark U - graduations from 1 to 12 in gm);

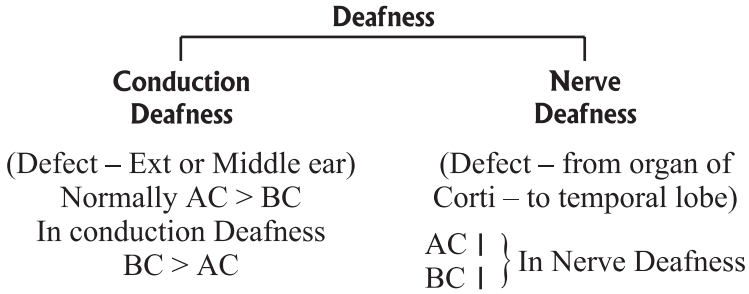
Method – Fill Urine up to mark U + Fill Esbach reagent up to mark R – Close + mix – keep for 24 hrs. Take reading after 24 hrs – of sedimented proteins.

8) Tunning fork



Limbs (U shaped two parallel limbs), Handle (foot plate),

Numbers – 256, 512 and 1024 Hz.



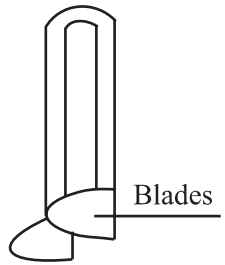
Hearing Test

i) Voice test (Conversation & Whispered)

ii) Tunning fork test (Rinne, Weber, Schwabach)

iii) Audiometry

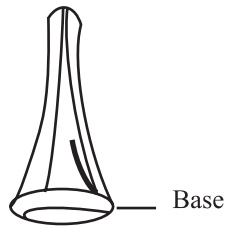
9) Nasal Speculum



Uses - Anterior Rhinoscopy, removal of foreign bodies, packing of nose in Epistaxis;

Parts - Blades and U shaped metal spring.

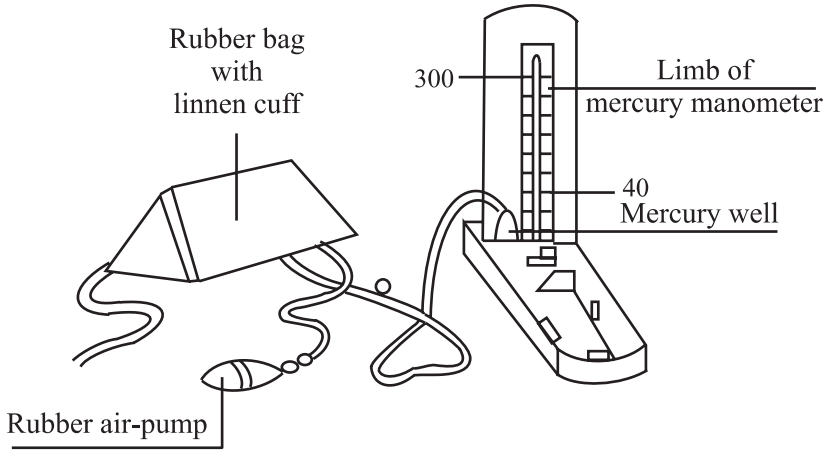
10) Ear Speculum



Uses - Examine Ext. Auditory canal + Tympanic membrane, Remove wax and foreign bodies.

Nasal and Ear speculums are used with head mirror and head light.

11) Sphygmomanometer



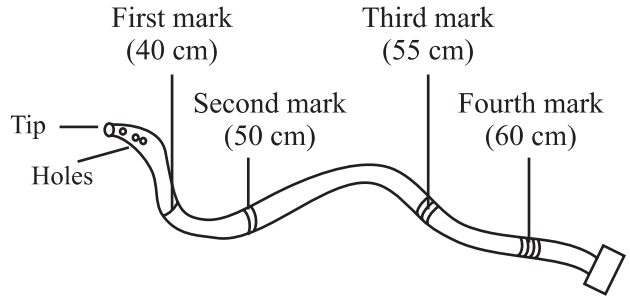
Riva Rocci- in 1896;

Parts – Mercurial manometer, Rubber bag with linen cuff, ruber pump with valve,

Manometer – 2 limbs - long and graduated (0 - 250 mm) and another short and broad (well).

Types of instrument – Mercurial, Anaeroid.

12) Ryle's tube



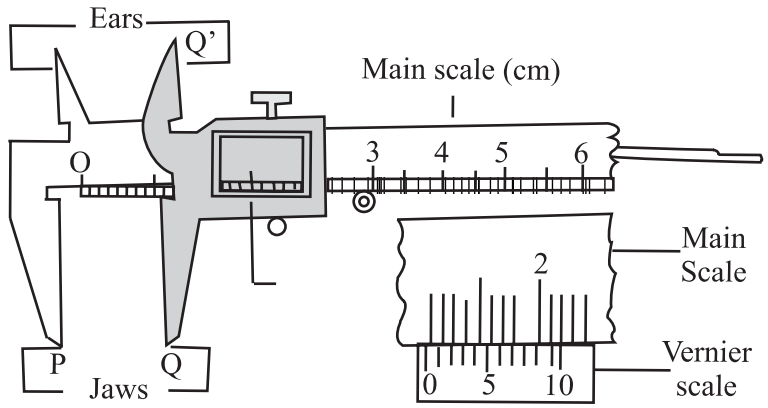
Uses – To collect gastric contents (for gastric analysis), To give stomach wash, in poisoning; For artificial feeding.

Parts – Polythene tube (Diameter – 8 mm), flexible –

4 markings

- 1st mark – 40 cm from tip – indicates tube has passed up to cardiac orifice of stomach;
- 2nd mark – 47 to 50 cm – tube is at body of stomach;
- 3rd mark – 54 to 55 cm – tube is at pylorus of stomach,
- 4th mark – 65 cm – tube has reached in Duodenum.

13) Vernier Calliper



Parts – Steel plate – graduated in millimeters and marked in centimeter, vernier scale, Jaws, Ears.

Use – One can measure length or diameter more precisely up to 0.01 cm.

अंगुली प्रमाण मापने के लिए उपयोग

अंगुली प्रमाण → महत्व → आयुष्यप्रमाण एवं बलप्रमाण निश्चिती के लिए।

संदर्भ

- **अथ पुन : आयुषो विज्ञानार्थम् अंगुलीप्रमाण सारान् उपपदेक्ष्यामः ।।**
- **तस्मात् आतुरं परीक्षेत् प्रकृतिश्च, विकृतिश्च, सारतश्च, प्रमाणतश्च, सात्म्यतश्च, सत्वतश्च, आहारशक्तिश्च, व्यायामशक्तितश्च वयस्तश्चेति बलप्रमाणाविशेष ग्रहण हेतोः ।।** **... च. वि.**

अंगुलिप्रमाण पध्दति

- **स्वपाणितलकुंचित संमितानि चतुरंगुलप्रमाणानि इत्यर्थः ।।** **... सु. शा.**

आयाम = विस्तार = 84 अंगुल

पौरुषमान = 120 अंगुल

अंगुली प्रमाण आयाम

पाद	(4)	जंघा	(18)	जानु	(4)	उरू	(18),
त्रिक	(12)	पृष्ठ	(18)	ग्रीवा	(4)	शीर	(6)

संक्षेपतः - (4 - 18 - 4 - 18, 12 - 18 - 4 - 6)

20. Histology

1) Histology

Microscopic structure of Tissue and Organ

2) 4 Basic Tissue types

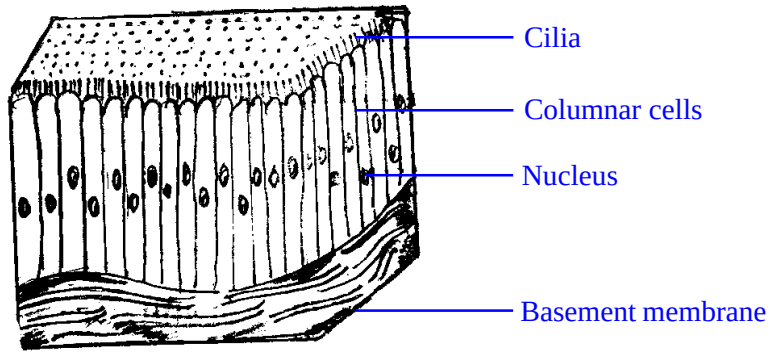
Epithelia, Connective, Muscular, Nervous

3)

i) Epithelium - Sheets of cells that cover the external surface of body, line internal cavities, organs, glands, ducts.

ii) Types of Epithelium - Simple (single layer cells), Stratified (Numerous cell layers), Pseudostratified (Single layer of cells attach to basement membrane)

iii) Epithelium Simple Squamous epithelium



Blood vessels, alveoli, Peritoneum (**Function –** protection, secretion, exchange of gases), **Cubical epithelium –** Digestive and salivary glands, Terminal Bronchioles (Function – Secretory), **Columnar Epithelium –** Stomach, Intestines (Secretion, absorption); **Ciliated columnar epithelium –** upper respiratory tract, Uterine tubes (movement of mucous liquid particles in Unidirection; **stratified squamous epithelium –** Keratinised – epidermis of palm and sole and Non keratinised – cornea, mouth, pharynx, oesophagus (exposed to wear and tear-become thick).

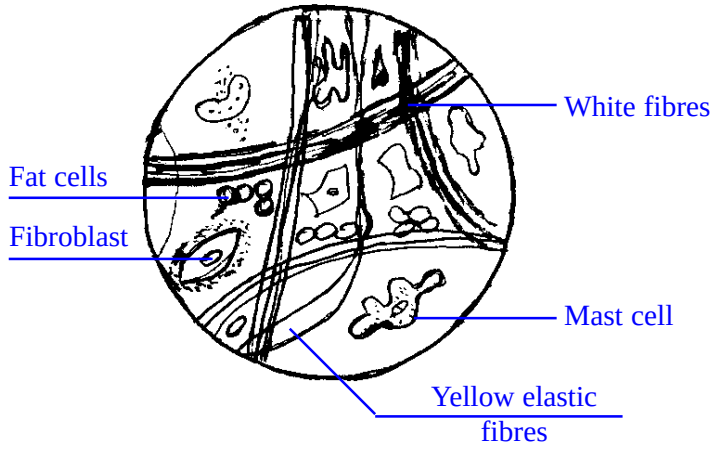
Slide of epithelium - Cilia, squamous / Columnar cells, Nucleus, Basement membrane

4) Connective tissue

Function

Binds, anchor, and support, various tissues, organs and body parts, **Areolar tissue –** Subcutaneous, between muscles, vessels, Nerves, in interior of organ. **Cells of connective tissue –** Macrophages or Histocytes (Phagocytes), fibroblasts (Production of connective tissue fibres), fibrocytes, Lymphocytes (Produce antibodies, role in inflammation), Plasma cells (Synthesize and secrete antibodies - Immunoglobulins), Leucocytes, Mast cells (Release Heparin and Histamine)

Slide - Yellow elastic fibres white fibres, fibroblast, cells, mast cells.

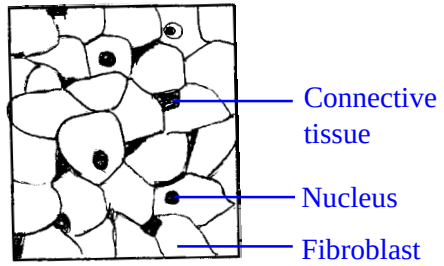


5) Adipose tissue

Omentum, buttocks, breast, mesentery, perinephric region

Function – Specific shape to body, shock absorber, fat storage, regulating body temperature. (Also see page 89)

Slide of Adipose tissue - Nucleus, connective tissue, fibroblast.



6) Muscle tissue

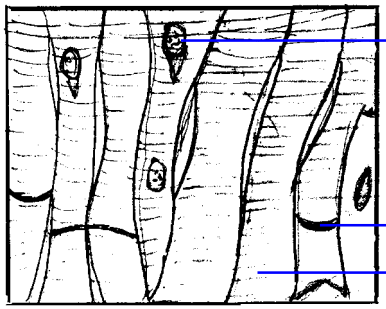
Skeletal (attached to bones), Cardiac, Smooth (stomach, Intestine, Blood vessels) (See muscle functions on page 88)

Slide of striated muscle

Light band and dark bond, Nuclei of muscle fiber, fibroblast

Slide of cardiac muscle

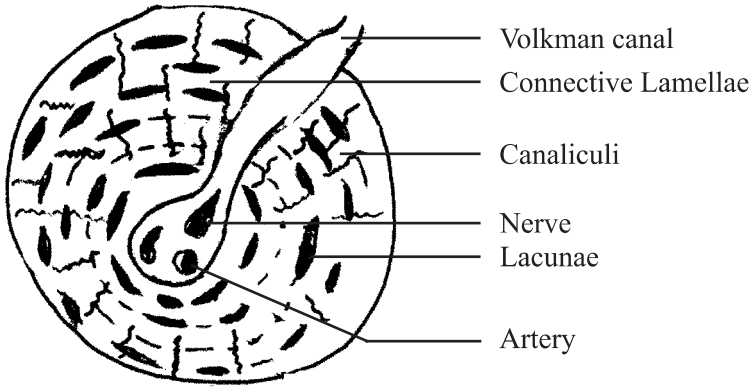
Intercalated disc, Nucleus, fibroblast, branching of muscle fibre.



7) Bone

Slide of Bone - Haversian canal, canaliculi. Lacuna containing bone cells, Volkman canal

(See functions of bone on page 90)



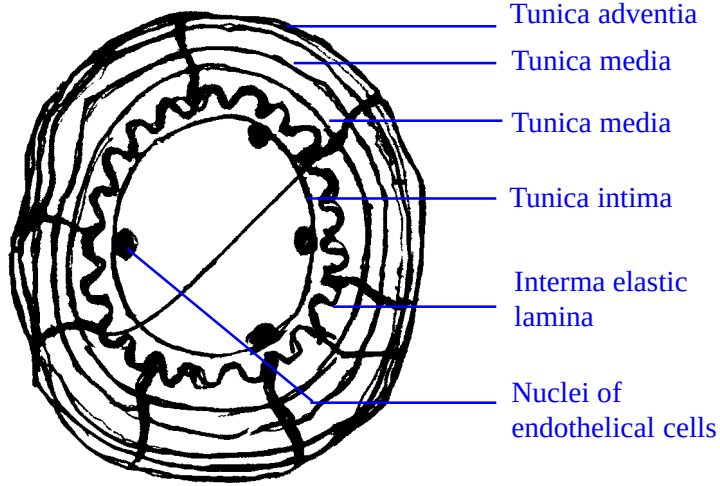
Harversian System

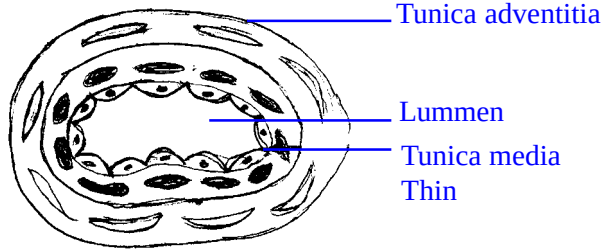
Structural and functional unit of compact bone. System includes - Harversian canal (Branches of horizontal channels known as Volkman's canals).

Harversian canal contains Blood vessels, Lymphatic and Nerves; **Concentric Lamellae** (8-10 layers of bones deposited around central H-canal); **Lacunae -** (Hollow spaces in between concentric lamellae which contain osteocytes); Canaliculi (wavy channels, which run around lacunae)

8) Blood Vessels (Artery / Vein)

Blood vessels - Tunica adventitia, Tunica media, Tunica Intima, Lumen of artery is small.





Tunica adventitia - Fibro elastic layer,

Tunica media - smooth muscle and elastic fibers,

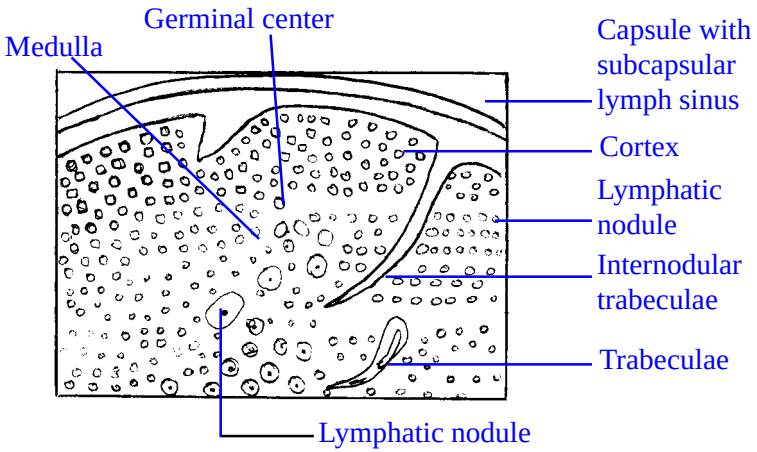
Tunica Intima - endothelial layer of Blood vessels.

Vasa Vasorum - Blood vessel present in Arterial wall (Tunica adventitia) to supply Blood to these layers.

T. media and intima - Thinner in veins.

9) Lymph - Node

Slide of Lymph node - Capsule, cortex, Internodular Trabeculae, Lymphocytes.



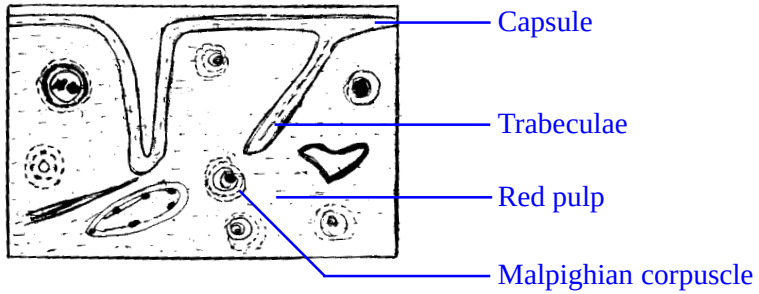
Lymph Node - Aggregation of Lymphoid tissue.

Functions - Filtration of Lymph, Production of Lymphocytes, Phagocytosis.

Germinal center - lighter area in lymph follicle - produces Lymphocytes.

10) Spleen

Slide - Capsule, White pulp, Red pulp, Trabeculae, Malpighian corpuscle.



Spleen - Largest Lymphoid tissue,
Trabeculae contains blood vessels

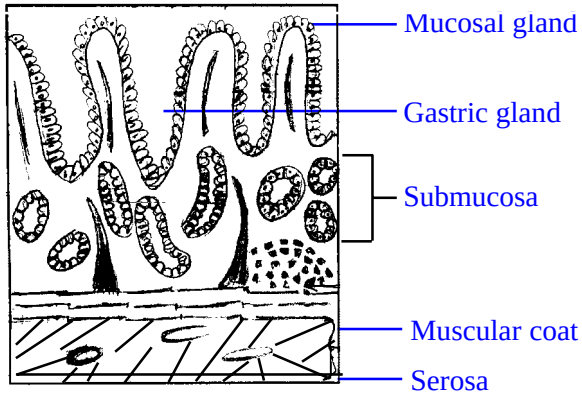
White Pulp - Produces lymphocytes ;

Red pulp - Consists of splenic sinuses and splenic cords.,

Functions - Formation of Lymphocytes, Phagocytosis, Blood storage.

11) Stomach (Stomach functions on page 58)

Slide - Serosa, muscularis (longitudinal-circular-oblique muscle layer), submucosa, mucosa, gastric pits, gastric glands, goblet cells.



Serosa - Peritoneum,

Submucosa - Arteries, veins, nerves;

Mucosa - Simple columnar epithelium.

4 types of gastric glands

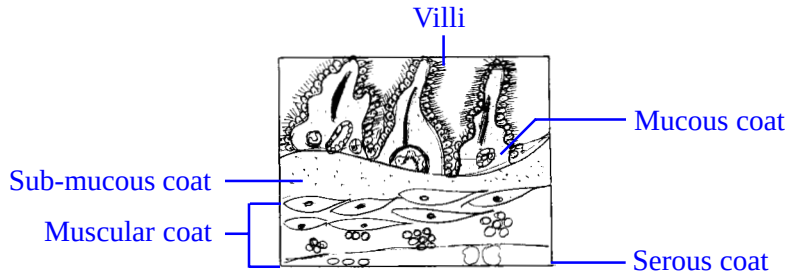
- **Chief or Zymogenic** - pepsinogen,
- **Parietal** - HCl and gastric intrinsic factor,
- **Mucous** - Mucus,
- **Enteroendocrine** - Stomach gastrin

(Gastric pits are deeper in pyloric part)

12) Small Intestine (Functions on page 60)

Slide - Serous, muscularis (Longitudinal, circular), submucosa, mucosa, villi, crypts of Liberkuhn

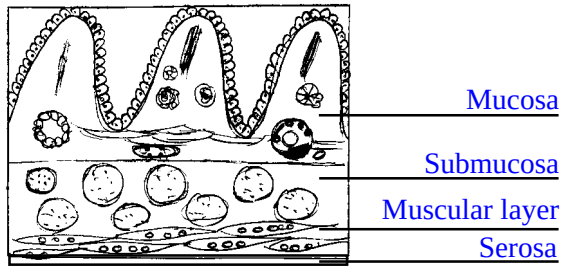
Mucosal folds = villi. Villi - Lined with ciliated columnar epithelium. At base of mucosa - Intestinal glands (Crypts of Liberkuhn). In mucosa - Goblet cells, Enteroendocrine glands.



13) Large Intestine

Slide - Serous, muscularis, submucosa, mucosa (villi- absent)

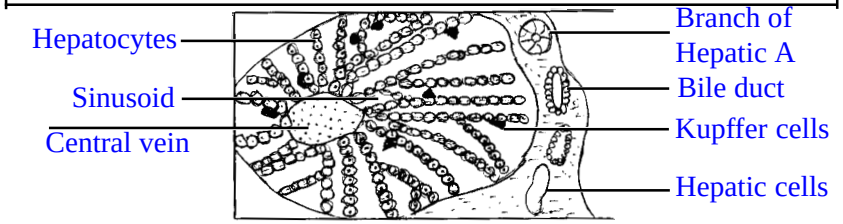
Mucosa - Few Intestinal glands, but goblet cells and lymphatic nodules - numerous.



Functions on page 61.

14) Liver

Slide Central vein, Hepatocytes, Branch of Hepatic Artery and portal vein + Bile duct; Kupffer cells, sinusoid, Bile canaliculi.



Liver - Largest gland - covered with connective tissue sheath (Glisson's sheath)

Bile - Formed inside the Hepatocytes.

Sinusoids - Contain R.E cells (Kupffer cells)

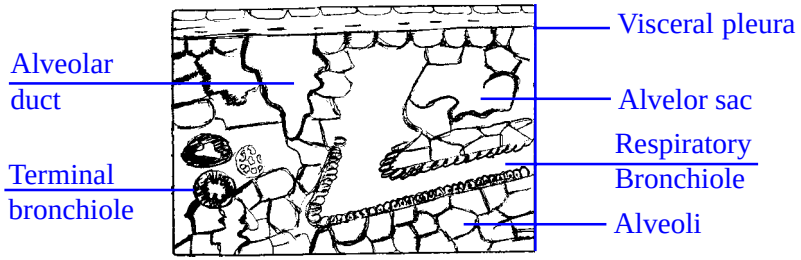
Functions of Liver

Formation of Bile, phagocytosis by Kupffer cells, Vitamin-Iron-fat storage. (Also see on page no. 61)

15) Lung

Slide - Visceral pleura, Respiratory Bronchiole, Alveolar duct, Alveoli

Lung - Main organ of R. S.

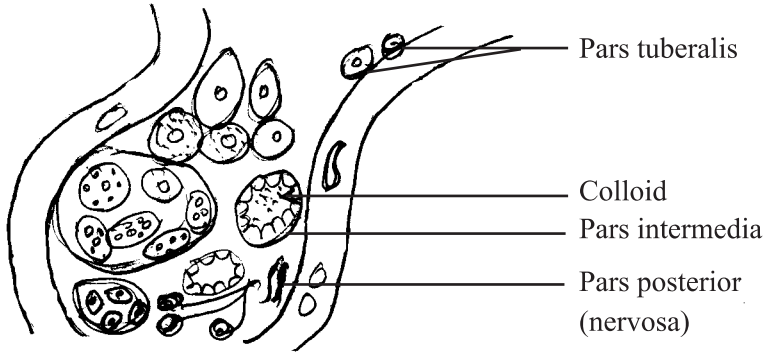


Fucntions - Gaseous exchange (Also see page 15)

Respiratory bronchiole - microscopic division of terminal bronchiole.

Alveolus - cup shaped cells situated around alveolar duct. Blood is separated from Alveolar air by alveolar epithelium and capillary epithelium.

16) Pituitary gland (Functions on page 92)



Slide of Anterior Lobe (Adenohypophysis)

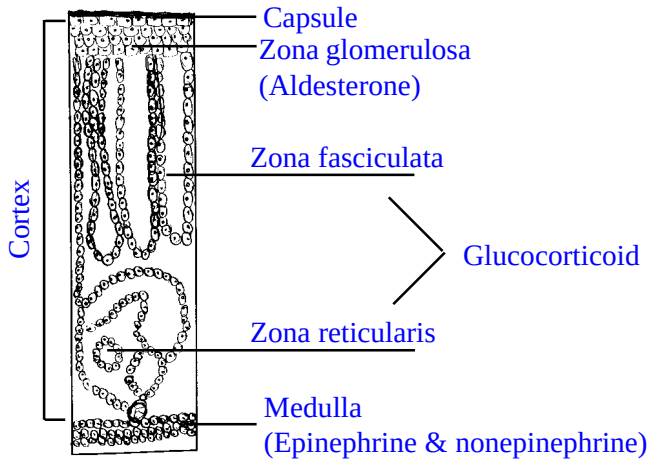
Pars distalis and pars tuberalis. Chromophobe and Chromophil cells (Acidophil,Basophil). Post.Lobe (Neurohypophysis)-Pars Intermedia and pars Nervosa (unmyelinated axons, pituicytes), Herring bodies

- **Acidophils** - G.H.; Prolactin
- **Basophils** - FSH, LH, TSH, ACTH

= Neurons in **supra-optic** and **paraventricular Nuclei** of Hypothalamus secrete 2 Hormones - Oxytocin and ADH; which are transported along microtubules in unmyelinated axons-to **Neuro hypophysis** and stored in Axon terminals **Herring bodies**. Released from Axon terminals into blood vessels as needed.

17) Supra-renal Gland (Functions on page 94)

Slide - Cortex, medulla, zona glomerulosa + zona fasciculata + zona Reticularis

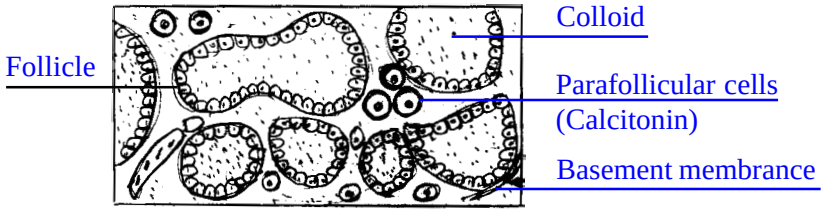


In cortex - Zona Glomerulosa → mineralo-corticoides; Zona fasciculata → Gluco corticoid; Zona Reticularis → Gluco corticoid.

Medulla - Chromaffin cells → Epinephrine and Nor-epinephrine

18) Thyroid Gland (Functions on page 94)

Slide - Thyroid vesicle, simple cuboidal epithelium, colloid material, para follicular cells

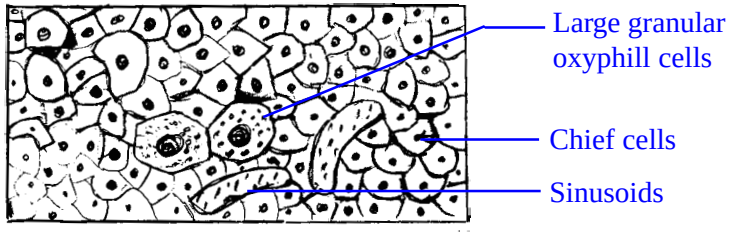


In thyroid gland - cells are arranged into spherical structures = **Follicles**. Follicles are **structural and functional unit** of Thyroid gland. Follicular cells - **secrete and store** their product in the Lumen as a gelatinous substance (Colloid - Thyroglobulin)

Parafollicular cells - synthesize and secrete - Thyro calcitonin

19) Parathyroid Gland (Functions on page 94)

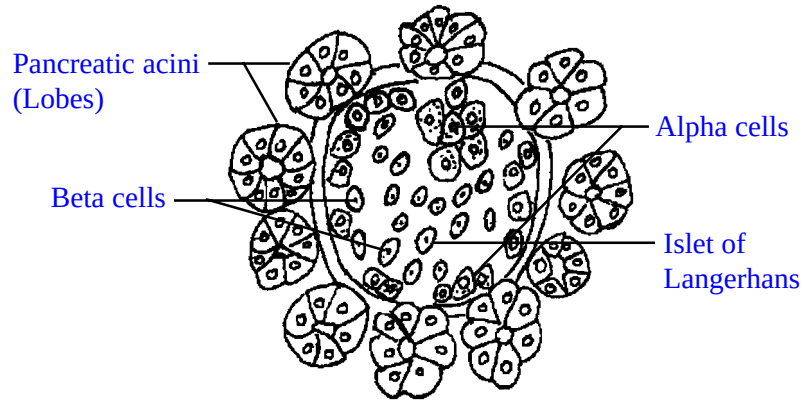
Slide - Chief cells, oxyphil cells, Adipose cells, sinusoide.



- **Chief cells** - Parathormone (PTH)
- **Oxyphil cells** - Function not known.

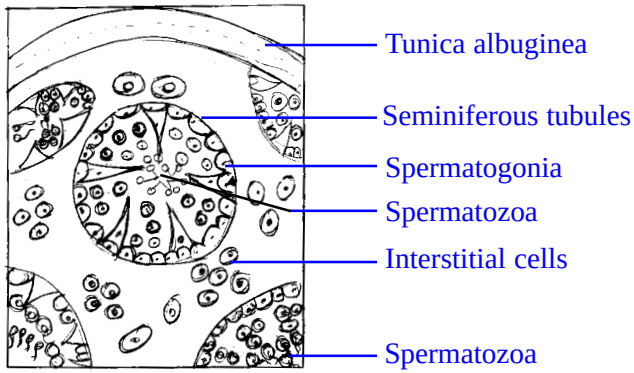
20) Pancreas (Functions on page 59)

Slide - Pancreatic acini, Islets of Langerhans - Alpha and beta cells.



Pancreas - Both Exocrine and Endocrine, Divided into Lobes, **Pancreatic Acini** → secrets Pancreatic Juice, Cells of Islets of Langerhans → **Beta cells -** Insulin, **Alpha cells** → Glucagon.

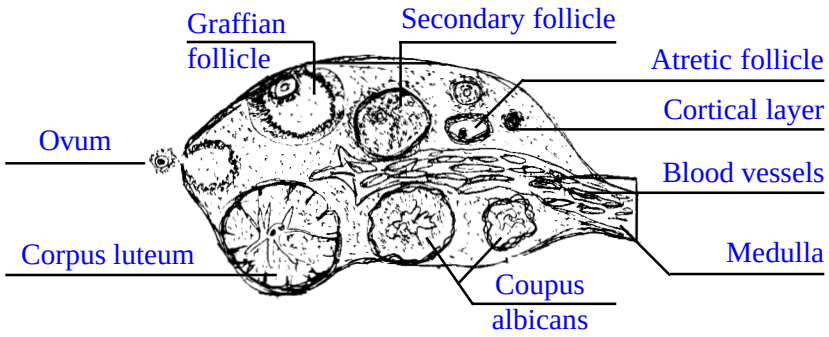
21) Testis (Spermatogenic cells, Sertoli cells, Cells of Leydig)



Slide - Seminiferous tubules, sertoli cells, Spermato - gonium, primary spermatocyte, secondary spermatocyte, spermatid, spermatozoa, Interstitial cells of Leydig.

Testis - Reproductive organ in scrotal bag. **Cover -** Tunica Albuginea and Tunica Vasculosa. **Germinal epithelium -** stratified epithelium - spermatogenic cells and **Sertoli cells** (support, protection and nutrition of developing sperms, phagocytosis), **Interstitial cells of Leydig -** secrete testosterone (Functions on page 94)

22) Ovary



Slide - Hilum, Primary follicle, Secondary follicle, Tertiary Graafian follicle, ovulation, Tunica Albuginea.

Ovaries - Female Reproductive organ.

Produces - Oestrogen and Progesterone.

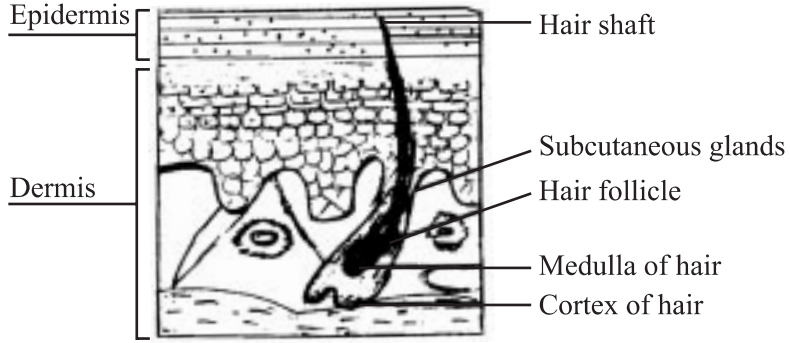
Tunica Albuginea - Capsule of connective tissue; **Ovarian follicles -** various stages, **Graafian follicle -** contains mature ovum and secretes oestrogen; **Corpus Luteum -** Develops from Graafian Follicle, after ovulation and secrete Oestrogen, Progesterone, relaxin, Inhibin. In absence of Pregnancy - corpus luteum starts degenerating on 27th day of Cycle and becomes **Corpus Albicans.** (While fibrous structure). Functions of oestrogen on page 95.

23) Skin

Slide - Epidermis, dermis, Hair Shaft, Hair Follicle, Erector pilli, Sebaceous gland

Epidermis – Stratified squamous epithelium. keratinocytes → present in palms, soles, hair, nails.

Melanocytes – Produce melanin.



Layers of epidermis

Stratum - 1) Corneum, 2) Granulosum, 3) Spinosum, 4) Basale, 5) Lucidum

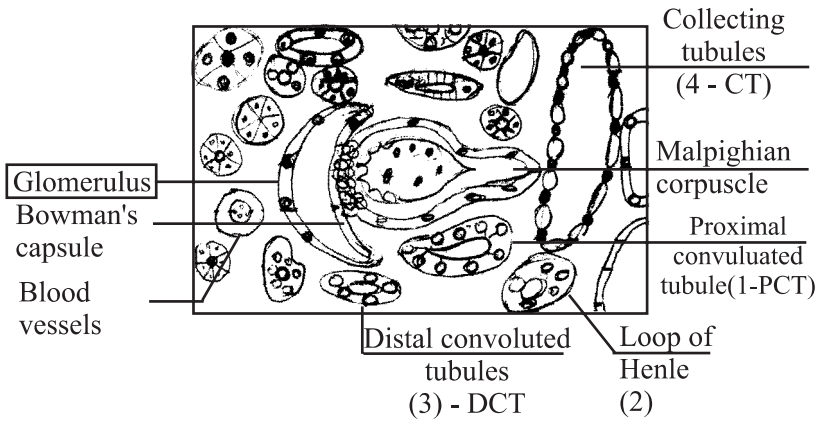
Dermis - connective tissue - 2 layers - 6) Papillary, 7) Reticular.

Hair - Shaft and root. (Also cortex, medulla, cuticle).

उपरोक्त सात नामों से सप्तत्वचा के विषय में जानकारी मिलती है।

24) Kidney (Functions on page 96)

Slide - Collecting tubule, Glomerular tuft, proximal convoluted tube, Distal convoluted tubules, Henle's loop.



Kidney - Urine formation. Nephrons are functional unit of kidney.

Nephron = Glomerulus (a tuft of capillaries) + Renal tubule.

Bowman's capsule - cap like beginning of Renal tubule. Capsule is lined by double walled epithelium

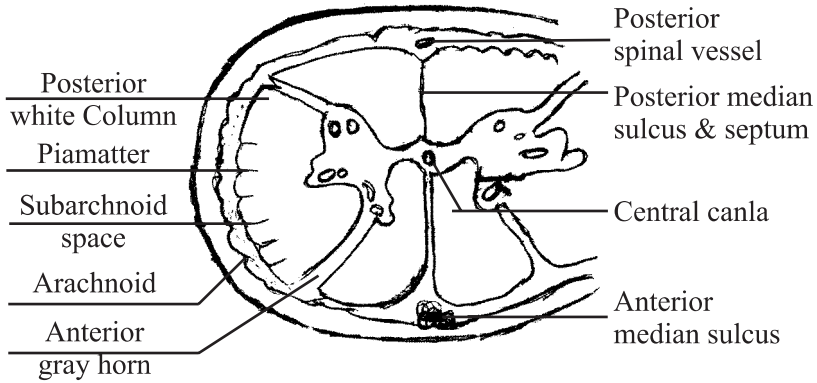
(These epithelial cells = **Podocyte**)

Malpighian corpuscles - Units of Glomerulus along with Bowman's capsule.

	Gland / Organ	Structural and functional unit
1	Thyroid	Follicles
2	Testis	Seminiferous tubules
3	Ovary	Graafian follicles
4	Kidney	Glomerulus

25) Spinal cord

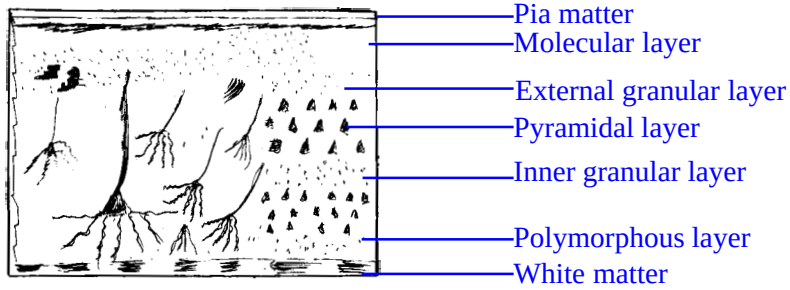
Slide - Central canal, Anterior and posterior median sulcus, Anterior and posterior Gray horn.



Central canal - Small space in the centre of Gray matter. It contains C.S.F.

Gray matter - in the form of Aphabet "H". Anterior and posterior. Gray horns consists of "Nerve cell bodies". This Gray horns divide white matter into - Ant./Post/Lat. White column. Columns consists of ascending and descending tracts.

26) Cerebrum

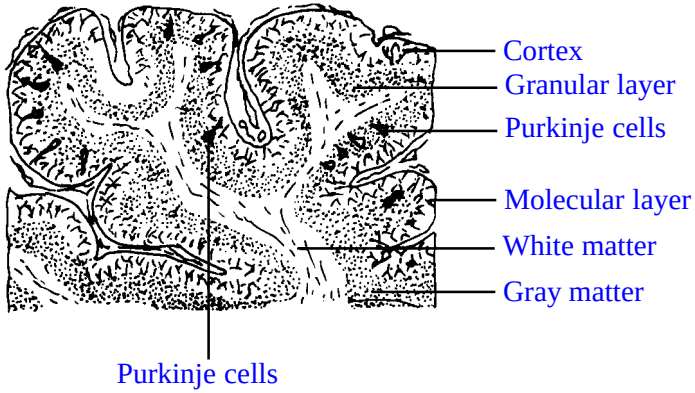


Slide - Layers of cortex - Pia matter, molecular layer (Axons and dendrites), Granular layer (Pyramidal layers), Internal granular layer, Ganglionic layer, multiform layer, White matter (under the Gray matter. Consists of myelinated nerve fibers)

Cerebrum - Highest centre of CNS. Surface = **cortex**

(made up of Gray matter)

27) Cerebellum



Slide - Cortex (Gray matter), Inner medullary region (white matter - myelinated Nerve fibres.)

Layers of cortex - Outer molecular layer (horizontal fibres), Inner granular layer (small Nucleated cells), Central layer of Purkinje cells

प्रकरण २१

Miscellaneous

1) Blood Group

Landsteiner's Law

Antibodies present in plasma is of opposite type as that of Antigen on RBC

Blood Group	Agglutinogen on RBC (Antigen)	Agglutinin in plasma (Antibody)
A	A	anti B
B	B	anti A
AB	A and B	———
O	———	anti A and anti B

Blood Group Importance

i) Before Blood transfusion → Grouping and Cross matching of donor and Recipient.

ii) Identifying paternity,

iii) To identify criminals

iv) In Rh – ve, pregnant lady, to avoid the problem of Erythroblastosis foetalis.

Erythroblastosis foetalis

First one should know that anti D antibodies do not exist naturally.

They are produced

a) Only by Rh – ve person

b) When Rh +ve Blood is given to him.

Now in Rh – ve lady, if Rh +ve baby in uterus. At birth +ve cells of baby escape to mother. Mother develops anti -D antibodies (First baby may escape from complications). Antibodies remain in circulation of mother. When next pregnancy occur and the child is Rh+ve, then in the child's blood Rh Antigen of self and Rh antibodies coming through mother's blood, will react with each other. Haemolysis occurs, Jaundiced baby. If reaction is severe, Miscarriage, Abortion also can occur. In this type of High Risk Pregnancy - Anti D Inj. is given to mother, to avoid sensitisation by foetal blood.

2) Collection of Blood

Different bulbs

i) **Wintrobe bulb (Double oxalated) -** For Haemogram, ESR, PCV. Ammonium oxalate 6 mg + Potassium oxalate 4 mg

ii) **Fluoride bulb** - For Blood Sugar - Sodium fluoride and potassium oxalate

iii) **Plain bulb** - For Serological tests like urea, creatinine, LFT, Lipid profile

iv) **Oxalate bulb** - to measure Prothrombin time - Bulb contains → Potassium oxalate

v) **EDTA bulb** - Platelet count - Bulb contains → Ethylene diamine tetra acetic acid.

vi) **Paraffin bulb** - Blood Gases - Bulb contains → Double oxalate + 1 ml liquid paraffin

vii) **Heparin Bulb** - Osmotic fragility test - Bulb contains → Haparin (0.1 - 0.2 mg/ml)

3) प्रात्यक्षिक परीक्षा के लिए प्रकृती परीक्षण

परीक्षण के मुद्दे तथा कंस में - (V, P, K) इस प्रकार लिखकर वात, पित्त, कफ के उत्कटत्व के लक्षण विषद किए है।

i) **शरीर (सार्वदेहिक)** - (V = अपचित, कृशदीर्घाकृती, दुर्भग, P = दुर्भग, तेजस्वी; K सुभग, प्रियदर्शन, सार-संहत स्थिर शरीर)

ii) **अवयव –** (V = बहु कंडरा), सिरा, प्रतान, परुष-वदन, पाणि, पाद, अंग; अनवस्थित, भ्रू, हनु, ओष्ठ, जिव्हा, शिर, स्कंध, पाणि, पाद, अस्थि; P = सुकुमार अवदात गात्र, प्रभूत पिप्लु व्यंग, तिल, कालक, पूती गन्ध, → कक्ष, वक्ष, अस्य, शिर, शरीर ; ताम्र-तालु, जिव्हा, ओठ, पाणि पादताल; K = उपचित परिपूर्ण सर्वगात्र, स्निग्धांग, श्लक्ष्णांग; महाललाट, पृथुपीनवक्ष, सुकुमार अवदात गात्र)

iii) **दंत** → (V = परुष/ सूक्ष्म/अति दंत, P = दंतविशुध्द वर्ण, K = ---)

iv) **नेत्र** → (V = चलदृष्टी, खर/धूसर वृत्त नेत्र, मृतोपमानि, उन्मीलितानि भवन्ति सुप्ते ; P = ताम्र, तनु, पिंग नेत्र, हिमप्रियााणि, क्रोधेन/ मद्येन/रवेश्च भासा - राग व्रजन्याशु ; K = सुस्निग्ध/विशाल/दीर्घ/सुव्यक्त, शुक्लासित- नेत्र, पक्ष्मल

v) **त्वचा /वर्ण** →(V = धूसर गात्र, P = गौर/उष्ण अंग, क्षिप्रवली; K = प्रसन्न वर्ण, सुस्निग्ध वर्ण, वर्ण - दुर्वा, इन्दीवर, निस्त्रिंश, आर्द्रारिष्ट, शरकाण्ड, प्रियंगु, शस्त्र, गोरोचन, पद्म, सुवर्ण)

vi) **केश/लोम/श्मश्रू** → V = परुष/रुक्ष/अल्प/स्फुटित/धूसर ; P = क्षिप्र पलित - खालित्य, मृदु/अल्प/कपिल; K = स्थिर/कुटिल/नील)

vii) **नख** → (V = परुष/अल्प, P = ताम्र, K = --)

viii) **सन्धि** → (V = सततसन्धिशब्द गामिन्यः, अनवस्थित ; P = प्रशिथिल संधिबंध मांस; K = गूढ/स्निग्ध /श्लिष्ट/सार-संधिबंधन)

गट 2 (क्रिया)

ix) **क्षुत्** → (V = दन्दशुक :, P = तीक्ष्ण बुभुक्षा, प्रभूत अशन, दन्दशुकाः ; K = अल्प क्षुत्, क्षुत् अतप्तो, अल्प भुक्ते - बलवानतथापि)

x) **तृट्** → (V = - -, P = पिपासावन्तः, प्रभुत पान ; K = अल्प तृष्णा, तृट् अतप्तो, अल्प पान)

xi) **हलचल/क्रिया** → (V = लघु / चपल - गती, चेष्टा, आहार, व्याहार : , दीर्घ अक्रमो ; P = - , K = मंद - चेष्टा, आहार, व्याहार; अशीघ्र आरंभ, दीर्घसूत्री)

vii) **वाणी/स्वर** → (V = प्रतत/रुक्ष/क्षाम/भिन्न/सक्त/जर्जर - स्वरः, बहुप्रलाप, विलपति अनिबध्द ; P = भुर्युच्चार, K = प्रसन्न स्वर, जल/मृदुंग/सिंहघोष सदृश स्वर)

xiii) **निद्रा** → (V = जागरुक, अल्प निद्रा, P = -, K = निद्रालु

xiv) **स्वप्न** → (V = सुप्ते शैलद्रुमास्ते गगनं च याति, P = सुप्तः सन कनक पलाश कर्णिकारान संपश्येत अपि च हुताश/विद्युत/उल्का ; K = सुप्तः सन् सकमल हंसचक्रवाकान् संपश्येत अपि च जलाशयान् मनोज्ञान)

xv) **अभिरुचि** → (V = सविलास, गीत, हास, मृगया, कलिलोला, मधुर/अम्ल/लवण-सात्म्य; P = दयित माल्य विलेपन मंडन, मधुर/कषाय/तिक्त सात्म्यम्, K = तिक्त, कषाय, कटुक, उष्ण, रुक्षम् भुक्ते/सात्म्य, संगीत/वाद्य/व्यायामशीलो

xvi) **अनभिरुचि** → (V = शीत असहिष्णवः, शीतद्वेषी ; P = उष्णअसहा, उष्णद्वेषी, क्लेश असहिष्णवः ; K = -)

xvii) **बुध्दि/स्मृती** → (V = श्रुतग्राहिणो अपि अल्पस्मृतयः, चलधृती, चलबुध्दी; P = मेधावी,निपुणमती, पंडित ; K = श्रुतिमान्, स्मृतिमान, दृढशास्त्रमति)

xviii) **स्वभाव** → (V = शीघ्रसमारंभ, शीघ्रक्षोभ/विकार/त्रास/राग/विराग, स्तेन, मत्सरी, कृतघ्न, नास्तिक, अजितेंद्रिय, अनार्य, लोलुप; P =तीक्ष्णपराक्रम, विगृह्यवक्ता, मानी, आश्रितवत्सलः, भूः क्रोध /ईर्ष्या,लौल्य, स्तुतिप्रिय ; K = अल्पक्षोभ, कृतज्ञ,अलोलुप, मानयिता गुरुणां, सौम्य, क्लेश/दुःख, अतप्तो, विनितो, अल्पक्रोध, गंभीर, दीर्घदर्शी)

xix) **सौहृद** → (V = अदृढ सौहृद, P = , K = स्थिरमित्र)

xx) **विकार** → (V = प्रतत, शीतक, उद्वेपक, स्तम्भ, P = व्यथित आस्यगतिः , K = अल्पविकार)

4) अंगुली परीक्षा

पाद (Foot - from heel to lateral malleolus,

जंघा (Leg from lat.malleolus to lower border of popliteal fossa),

जानु (knees - from lower margin to upper margin of popliteal fossa),

उरु (Thigh - from upper margin of popliteal fossa - to fold of groin)

त्रिक (Sacrum and coccyx → from fold of groin to ASIS),

पृष्ठ (Back - from ASIS to 7th cervical vertebra),

ग्रीवा (Neck - from 7th cervical vertebra to posterior occipital tuberence),

शिर (Head - from posterior occipital tuberance to vertex / Lambda)

5) अग्नि परीक्षण

मंदाग्नि (कफ), तीक्ष्णाग्नि (पित्त), विषमाग्नि (वात), समाग्नि (समदोष)

तीक्ष्णाग्नि → हर 3/4 घंटों के बाद भूख लगती है और भूख सहन नहीं होती।

मंदाग्नि → एक बार अन्न सेवन करने पर 8-10 घंटे क्षुधाप्रवर्तन नहीं होता।

विषमाग्नि → क्षुत्बोध - हर दिन अनियमित स्वरुप का।

समाग्नि → एक बार अन्न सेवन करने पर 6 से 8 घंटों के बाद क्षुत्बोध।

अग्नि → वय, लिंग, व्यवसाय, ऋतु, देश, आहार द्रव्य के गुण (गुरु/लघु),आहारमात्रा इनके अनुसार बदल सकता है।

6) बल

कष्ट सहने की क्षमता/ताकद। बल-व्याधीक्षमत्व परस्परावलंबी।

- **बलं व्यायामशक्त्या परीक्षेत्।**

  शरीर आयासजनकं कर्म व्यायाम इति उच्चते। भारवहनादि शक्ती ॥

बल परीक्षण (Harward Step Test)

$$PEI = \frac{\text{Duration of Exercise in seconds}}{2\times(A+B+C)}\times 100$$

A = Pulse in 1 - 1.5 min

B = Pulse in 2 - 2.5 min

C = Pulse in 3 - 3.5 min

बल – देश, काल, वय, लिंग, धातुसारता, अग्नि, प्रकृती, कुल आदि पर निर्भर।

बल प्रकार – शारीर / मानस।

बल प्रकार – सहज / कालज / युक्तिकृत।

अर्धशक्ति व्यायाम लक्षण

मुख से श्वसन करना पडना, गला सूखना, माथा, नासा, कुक्षी आदि में स्वेदप्रवृत्ती।

7) ऋतु-दोष संबंध

दोष	चय	प्रकोप	प्रशम
वात	ग्रीष्म	वर्षा	शरद
पित्त	वर्षा	शरद	हेमंत
कफ	शिशिर	वसंत	ग्रीष्म

8) Hearing Tests (By Tunning fork)

i) Rinne's test

Vibrate tunning fork. First keep it on mastoid bone. When hearing stops, hold it in front of Ear. Normally, the person should be able to hear the vibrating sound. Then it proves AC > BC. But if the person can not hear by Ear, then it indicates BC > AC. Which occurs in conduction deafness. (E.g. Wax, otitis media)

Limitation of Rinne's test

We can not detect Nerve deafness.

ii) Weber Test

Vibrate tunning fork. Keep it on vertex or on forehead, person should hear equally on both side. If he hears better on right side, then conduction deafness of right ear or Nerve deafness of left Ear.

Limitation of weber Test

Doctor can not detect exactly, which Ear is defective. Hence, this test is performed at last.

iii) Schwabach test

Vibrate tunning fork. Hold it in front of the Ear of patient. When he stops hearing, the fork is taken in front of Doctor's Ear and he confirms that sound has stopped. This suggests that patients AC is normal. But if still Doctor can hear the sound, it means patients AC is reduced.

The same method is repeated for testing Bone conduction. (By keeping fork on the mastoid bone)

If AC, BC, both has reduced - It indicates "Nerve Deafness".